THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. VIII. No. 186—11th YEAR.] LONDON, DECEMBER 6, 1859. [Subscription per Ann. { 15s. in Advance / 18s Credit.] DOUBLE No. Price 1s.

CANNEL COAL.

RAMSAY'S NEWCASTLE CANNEL was discovered by the Advertiser in 1818. Cannel Coal was then little used in London: after surmounting much opposition, it has become the principal Cannel Coal used in the Metropolis, and has greatly assisted in improving the London gas. Its joint products of gas of high illuminating power, and coke of good quality, make it one of the most economical coals known. It is used by all the London Gas Companies, as well as by many Provincial and Foreign. The Crystal Palace was lighted from it in 1851, and the Post-office, Bank, and *Times* Office, are at present.

FIRE-CLAY RETORTS.

FIRE-BRICKS of all descriptions. Manufactory established in 1804.

RAMSAY'S GARESFIELD COAL and COKE.

Bone and Artificial Manures of all kinds.

Address G. H. RAMSAY, Offices, Broad-chare, Newcastle-on-Tyne.

April 27, 1854.

TO GAS MANAGERS AND OTHERS.

WANTED, a person to undertake the MANAGEMENT of the EASTBOURNE GAS-WORKS, supplying all labour necessary for the Manufacture and Distribution of Gas, the lighting of the Public Lamps, the laying down new Mains, and the laying on new Services, &c.

Further particulars may be had on referring to Mr. J. H. CAMPION COLES, Secretary, EASTBOURNE, to whom applications, stating terms, and with Testimonials, must be sent on or before the 10th day of December next.

LEONI'S Patent Adamas Gas-BURNERS (secured by Her Majesty's Royal Letters Patent), are entirely free from liability to CORROSION, injury from Heat, or danger of Fracture, and are UNALTERABLE in the dimensions of their Apertures.

Uniformity in the consumption of Gas is obtained by the process of manufacture, which ensures that the Burners shall be of precisely similar pattern.

The Adamas Burners are confidently recommended to Gas-Fitters, Consumers, and Companies.

Sole Manufacturer and Patentee in Great Britain, S. LEONI, Adamas Works, St. Paul Street, New North Road, LONDON, N.

WANTED, at a Gas-Work, a steady man as FOREMAN STOKER, and to take charge of the Works.

For further particulars apply by letter addressed to the SECRETARY, Gas Company, GRANTHAM.

WANTED, a Gas Foreman, capable of carrying on the duties of a small Gas-Work for lighting a Village with 300 lights, including the Gas-fitting, taking of Meters, &c. A two-roomed cottage at Works, with coal and gas free.

Applications, stating wages asked, with qualifications, &c., to be addressed to the SECRETARY, at Menai Bridge, Anglesey, NORTH WALES.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COAL AND COKE.

Coal and Coke Office,

QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.

JOHN RUSSELL AND CO.,

THE OLD TUBE WORKS,

CHURCH HILL, WEDNESBURY;

ALMA WORKS,

WALSALL, STAFFORDSHIRE;

and 69, UPPER THAMES STREET, LONDON,

Original Manufacturers of Wrought-Iron Gas Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.

Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.

N.B. All Goods thoroughly Tested before sent out, and Warranted.

TO Mr. BENJAMIN WHITEHOUSE,

GASHOLDER MAKER,

WESTBROMWICH, NEAR BIRMINGHAM.

Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.

During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.

RICHARD JONES.

Engineer to the London Gaslight Company.

Vauxhall, London, Nov. 9, 1859.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS, NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

London Agents:

JAMES LAWRIE & CO.,

63, OLD BROAD STREET, CITY, LONDON.

TO THE DIRECTORS OF GAS COMPANIES.

THE Advertiser, who has a thorough knowledge of Gas Making, Distribution, and Fitting, is capable of Superintending all alterations or repairs of Works, and has the sole Management of those on which he is now engaged, as well as keeping and collecting the Accounts, is desirous of obtaining a similar SITUATION, where the make is from 30,000 to 60,000 feet per day, or as MANAGER only of larger Works. First-class Testimonials given.

Address L. M., Mr. LODER'S, Bookseller, LINCOLN.

TO GAS COMPANIES.

THE Advertiser (aged 28), who for five years past has successfully managed a Gas-Work, is desirous of an engagement as MANAGER of a Work making 8,000,000 or 10,000,000 feet per annum. Has been brought up in one of the largest provincial works, is a practical mechanic, and has had considerable experience in the erection of works. Well versed in the most approved methods of gas manufacture and distribution, and competent to carry out all extension and improvements of works, laying of mains and services. Has a practical knowledge of fitting; can prove, repair, and take indications of meters; keep accounts, and collect rental. Can have the highest Testimonials for character and ability from present and former employers.

Address J. C., care of Mr. W. B. KING, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, a Situation as Manager of a Gas-Work, by a young Man, aged 30, who thoroughly understands the various branches of Gas Manufacturing, laying Mains, Fitting, &c.

Good References and Testimonials can be given from his last employers.

Address to HENRY CARTER, at Mr. SIDWELL'S, Richard Street, Aberavon, Glamorganshire, SOUTH WALES.

FOR SALE, a 6-horse Horizontal ENGINE, nearly new, having been used for a few months only to work an Exhauster. To be seen at the SOUTH METROPOLITAN GAS-WORKS.

THE IMPERIAL IRON TUBE COMPANY,

(SUCCESSORS TO GEORGE B. LLOYD & CO.,)

GAS STREET AND BERKLEY STREET,

BIRMINGHAM,

Manufacturers of Wrought-Iron Tubes and Fittings,

FOR GAS, STEAM, AND WATER.

PATENT GLASS ENAMELLED AND GALVANIZED TUBES,

AND

LAP-WELDED IRON BOILER TUBES.

LORD REDESDALE'S ACT.

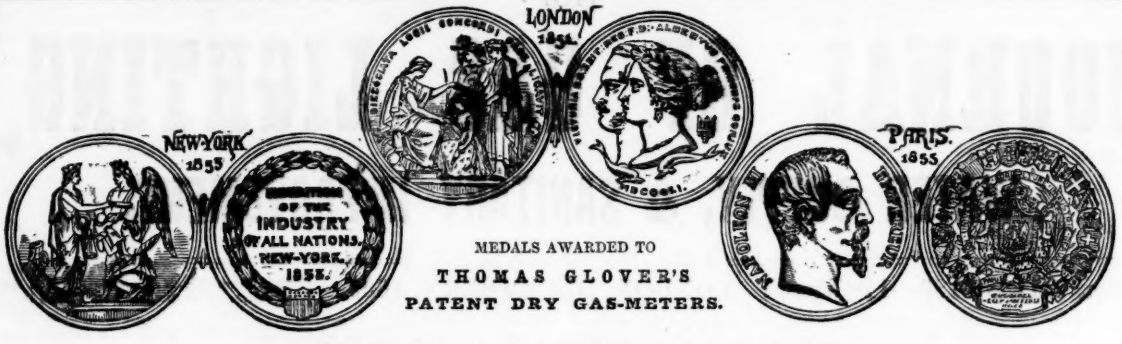
GAS-METERS.

D. HULETT & CO.

Have always made their Meters with the Low Spouts; consequently no alteration is required.

55 and 56, HIGH HOLBORN, LONDON.

JOURNAL OF GAS LIGHTING ONE PENNY NEWSPAPER



MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

THOMAS GLOVER,

PATENT DRY GAS-METER MANUFACTURER,

SUFFOLK STREET, CLERKENWELL GREEN, AND
ALLEN STREET, GOSWELL STREET, E.C.

Established 1844.

LORD REDESDALE'S "SALE OF GAS BILL."

LONDON, August 15, 1859.

THOMAS GLOVER takes the earliest opportunity of intimating to Gas Companies and his other Customers that, as Lord Redesdale's "Sale of Gas Bill" has determined the unit of measurement, he is now prepared to supply his Patent Dry Gas-Meters guaranteed to meet all the legal requirements of that bill.

THOMAS GLOVER confines his sole attention to the business of Gas-Meter Making. The propriety of his doing so is satisfactorily proved by his success; and, without the practice of any quackery, or any attempt to delude the public by an absurd exhibition of "Old and New Valves," his Meters are in general use by the Metropolitan Gas and other Companies in this Country and abroad. For example, one Metropolitan Company have now in use above **12,500** of his Patent Dry Gas-Meters; some of these Meters have been fixed for Fourteen Years, and are still in working order, without complaint from either the Company or the Consumer.

THOMAS GLOVER thinks it necessary to put Gas Companies on their guard against parties selling Patent Dry Gas-Meters constructed in imitation of his, but unskilfully made on erroneous principles, and with improper and unsuitable materials.

THOMAS GLOVER'S Workshops are now the most extensive in this or any other Country, and he is thereby enabled promptly to execute orders to any extent required. Purchasers may at any time inspect his Works and the Materials of which his Meters are constructed. He is ready to enter into Contracts with Gas Companies and others to uphold their Stock of his Meters for Twenty Years at an annual charge varying from 2½ to 5 per cent., and to leave always in the hands of Gas Companies Three Years' charge for upholding, as a guarantee for the fulfilment of the Contract.

CROSLEY & CO.

ARE PREPARED TO SUPPLY GAS COMPANIES AND OTHERS WITH

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

Similar to that Manufactured by them, and verified by

The ASTRONOMER ROYAL, and Professor MILLER, of Cambridge,

ON BEHALF OF THE GOVERNMENT,

Which was deposited by C. and Co. in the Office of the
COMPTROLLER-GENERAL of the EXCHEQUER before the 13th ult., in compliance with the

"ACT FOR REGULATING MEASURES USED IN SALES OF GAS."

THEY ALSO SUPPLY

TEST GASHOLDERS,

Graduated by the Standard Cubic Foot.

103, SOUTHWARK BRIDGE ROAD, LONDON, S.E.

CONTENTS.

	PAGE
Leading Articles:—	
Notes upon Passing Events	647
The Metropolitan Gas Supply	649
Appointment of Meter-Inspectors	650
Circular to Gas Companies	651
Communicated Articles:—	
Superannuation and Sick Funds	652
Correspondence:—	
Appointment of Meter-Inspectors	653
Register of New Patents:—	
Parfitt's Improvements in Gas-Burners	653
Bent's Improvements in Gas-Meters	653
Harmer's Improvements in Parts of Dry Gas-Meters	654
Farrene and Subra's Improvements in Gas Lighting	654
Provisional Protections	654
Notices to Proceed	654
Parliamentary Intelligence:—	
Notices given for Gas, Water, and Improvement Bills	654
Legal Intelligence:—	
Court of Exchequer.—Hills *v.* the London Gas Company	655
Miscellaneous News:—	
The Metropolitan Gas Supply—	
Meeting of the Delegates	669
Deputation to the President of the Board of Trade	671
Deputation to the Home Secretary	672
The Gas Question in Manchester	673
On Sounds emitted by the Combustion of Gas	674
The Lime Light Company	674
Price Current	674

NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, Dec. 20, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

TO CORRESPONDENTS.

Decarbonizing Retorts.—*Messrs. Young and Robb must excuse us if we decline to reopen this controversy by the insertion of their letters, more especially as both profess to be content with the note we appended to their last communications, and only take exception to some of each other's statements in which the public can have no interest.*

X. Y. Z., Chelsea.—*Upwards of five hundred responses have been received to our application for the data required to enable us to compile a correct Share List of Gas Companies, which will be published in the first number for January; and we purpose taking similar steps for preparing a Share List of the Water Companies of the United Kingdom.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 6, 1859.

NOTES UPON PASSING EVENTS.

REALLY the disciples of the Registrar-General seem to be desirous of the merit of destroying the system with which they are connected. It was bad enough when the chief of the band commenced his crusade against the London Water Companies, and compromised himself by his advocacy of the monstrous Bala Lake scheme; but lo! the District Registrar of Worthing comes forward to crown the absurdities of the pseudo-statistical observations of his chief, by the corrections of them he takes the liberty to address to the public Press. The Registrar-General modestly claimed for Worthing an annual average mortality of 17 per 1000; the District Registrar declares that the mortality *during an unfavourable season* of three months' duration was below 2¼ per 1000, or below 9 per 1000 per annum! Either the District Registrar must have made some egregious blunder, or the dwellers at Worthing are about to become immortal. Both these suppositions open the door to curious speculations; yet as the former one is by far the more probable, we would suggest that, as it is notorious the scientific deductions of the advisers of the Registrar-General require confirmation by independent inquirers, so also it would be desirable that the statistics emanating from the same class of officials should be controlled by men who would be less likely than they are to repeat the cry of the official oracles. However this may be, the letter of the Worthing Registrar simply leads us to question the value of the whole of the returns furnished, not only by him, but by his colleagues; and we would remind these ever energetic gentlemen that very often men, in striving to prove too much, disprove everything.

It may be as well here to call attention to an incidental passage in the last Quarterly Report of the mortality of England, in which the Registrar-General alluded to the reappearance of endemic ague in the Fen Districts of Wisbeach, &c., because that phenomœnon seems to be, in some mysterious manner, connected with the fearful visitations of cholera and ague which have exercised such ravages in Northern Germany, in Holland, and in Belgium during the last summer and autumn. Formerly, ague was as constant a scourge of our Fen districts as it is even now of the Low Countries; but of late years, in consequence, perhaps, of the application of steam power to drainage purposes, the climate of those regions has changed to such an extent that this particular form of endemic disease had almost entirely disappeared. Simultaneously with the improvement in the general health of the Fens, it is worthy of remark that the habitual use of opium in its various forms had decreased; to be replaced, we regret to say, by the use of gin. A very interesting question thus arises—viz., whether the change of habits above referred to may have had any influence on the return of the local disease; or, in other words, whether it were, or were not, a wise proceeding to abandon the use of a drug which formerly at least was considered a specific against the endemic disease of the Fens. Probably in this, as in most cases, truth lies in the mean; and there may be as much danger in attributing infallible preservative powers to opium as there seems to have been in the too energetic exclusion of it. But this is, after all, a subsidiary consideration compared with those suggested by the peculiar circumstances attending the outburst of Ague and Cholera, in an epidemic form, in the whole of the flat alluvial districts of North-Western Europe during the current year. It is literally fearful to hear the accounts, and to witness the ravages, of the various forms of ague, typhus, typhoid fevers, cholera, and diarrhœa, which are to be met with throughout those countries. It would seem, indeed, that there is some mysterious analogy between those various forms of disease, and medical men would do wisely to examine the considerations which may spring from this supposition; for, if it should prove to be at all founded, they might be led to introduce some modifications into their curative system, for the cholera especially. This must, of course, be left to more competent inquirers than we can pretend to be. In the meantime we would observe, that, whilst ague in a mild form has unexpectedly returned in the neighbourhood of Wisbeach, the typhus and typhoid fevers have ravaged North Holland and Friesland with the violence of a plague; whilst the so-called Asiatic Cholera has raged with equal violence in the Duchies of Schleswig, Holstein, Mecklenburg, Schwerein; in Groningen, South Holland, Belgium, Westphalia, &c. In face of these awful visitations, and of the mystery enshrouding them, how revolting it is to be met with the old parrot cry of "sanitary measures!" How very painfully are we made to feel the utter inanity of our present knowledge of a subject which affects so directly a very large population, even in our own country, wherein sanitary science has been supposed to have made such astonishing progress. Verily, verily! all that we do know is, that we know nothing with certainty.

Great though the interest may be attending the investigation of these abstruse physiological questions, there have lately been brought prominently into notice some social and political ones of nearly equal moment, to which we ourselves turn with something like a feeling of relief. Amongst these the recent proposition of the Metropolitan Board of Works to continue, for its own behoof, the Coal Tax—that last relict of the barbarous *octroi* system—which the Manufacturers of London had calculated upon seeing withdrawn in a few months, may be cited as affording a worthy pendant to the policy of the Manchester Corporation in taxing the Gas Consumers for the benefit of the Water Consumers. We talk about the march of intellect, and we flatter ourselves that our public morals are of a higher tone than those which prevailed "in the days of Walpole and Newcastle," yet we find that men calling themselves

social philosophers will coolly advocate "the robbery of Peter to pay Paul," solely because Peter may happen to be the richer of the two. We find the members of our Metropolitan Board as coolly defending an indirect tax on manufacturing industry—a tax which, from its very nature, must be an unequal and unfair one—on the ground that, inasmuch as the majority of the London public would not *feel* the annoyance of the impost, less difficulty would be made in granting it. Really it seems to us that all the arguments yet urged in favour of the continuance of the Coal Tax ought to ensure its abolition. The very essence of a popular control over taxation consists in the vigilance with which its perception and appropriation are carried into effect; and thence it is that all governing bodies are so anxious to possess a revenue which may save them from the disagreeable task of rendering an account of their stewardship, for popular control is an irksome restraint on all such bodies, be they municipal or be they governmental. To say that the Coal Tax should be continued because it would not be felt, seems, therefore, to us to be tantamount to saying that it is advisable to bribe the inhabitants of London into the neglect of their duty of watching their own Representatives. But, in addition to this objection, there seems to us to be a more serious one in the partiality and the inequality with which the Coal Tax bears upon the various classes of the community. Under all such imposts men pay rather according to their means than to their wants, if they simply consume the taxed article for their own personal requirements; but if, as in the case of coal, the taxed article should form an essential element in the cost of production of manufactured goods, the mere fact of the existence of such a local tax places the local manufacturer in a disadvantageous position compared with his rivals who carry on their business in localities exempt from the burthen. We are far from believing that the inhabitants of London are indisposed to pay their fair respective proportions of the outlay required for the improvement of their city; but, even if they were anxious to cast upon others the burthen they themselves should bear, we cannot believe that they ought to be allowed so to do. In the meantime we distinctly state that the Metropolitan Board of Works has exhibited neither the talent, nor the principle, to induce the public to entrust it with even the semblance of irresponsible power, such as it would possess if it had a revenue obtained by indirect taxes.

Our neighbours in France seem to find quite as much difficulty as we do in England, or our transatlantic brethren of New York do, in dealing with the grave questions of the municipal organization of their capital. Under any circumstances, it must be a difficult task to regulate the powers and attributions of a large capital, because it has a great tendency to constitute as it were an "*imperium in imperio;*" and to trench upon the powers of the government of the country at large. In France this danger is increased, from the fact that, both intellectually and administratively, everything centres in or emanates from Paris; and the capital exercises far more than its natural influence. Even the present Emperor has found more difficulty in managing the municipality of Paris, than he has done in dealing with the so-called National Assemblies which are still allowed to exist in France; and now that the extension of Paris to the fortifications, and the inevitable increase of its population, in consequence of the termination of the great trunk lines of railway, has still further developed the importance of the town, it seems that the Imperial Government finds it necessary to destroy even the small vestige of independent municipal organization which it had hitherto tolerated. There is under consideration, if all reports be true, a scheme for establishing a Ministry for Paris; and as though still more effectually to destroy the independence of the Town Council, of rendering the place of Municipal Councillor a paid place under the Government—"*On penche du côté où on va tomber.*" How strange it is that neither men nor States can ever profit by the lessons of experience, or apply to their own cases the illustrations to be derived from what had previously occurred! The French Government (after having through successive generations pursued the system of destroying all local liberties, in order that its chief might carry out the boast so proudly uttered by the Grand Monarque, "*l'Etat c'est moi,*") seems at last to have arrived at the culminating point of that system, and to be rapidly declining into a merely personal government, the success and brilliance of which depends solely upon the Ruler of the day. What will be the morrow of such a rule? who is to carry on the wonderful machinery when the present strong hand and iron will is withdrawn? Yet we are urged to imitate this fearfully temporary system, and to abandon our principles of self-government and of self-reliance in order to substitute for them those of a paternal irresponsible despotism. Ah! that we, the writers of this JOURNAL, dared to say half that we know of the doings of paternal governments! But, unfortunately, the revelations of the recent political doings at Gloucester, Norwich, or at Louvain, cause us to hesitate before we cast the first stone. In the meanwhile it is a rather remarkable fact that, at the present day, the best intellects of France are, one after another, protesting against the consequences of the fatal centralization of all the powers of that country into the hands of the State, precisely at the time that our Social Science (place) mongers are urging us to run the same dangerous course. Even the French law of inheritance, so much admired by our Reformers, is the object of bitter attack in France by many of its truest patriots.

Amongst local affairs, little of importance has occurred during the last fortnight, excepting, perhaps, the commencement of a series of actions which hereafter may become numerous, if the tone of morality amongst our municipal bodies should not improve. We allude to the proceedings in the case of *Ward v. Lowndes*, in which an application has been made for a *mandamus* to compel a Local Board of Health to make a rate, in order to satisfy certain claims upon it. The various Assurance Companies would do wisely to watch the proceedings in this instance, for the value of the securities they hold for the loans made to Local Boards will materially depend on the powers which may exist for compelling their fulfilment. It has always appeared to us that, in fact, the security given by a Local Board is of the very worst possible description, when the inhabitants are disposed to be dishonest, or when the outlay for which the loan has been incurred has been useless. Should a *mandamus* issue, what power is there to compel the inhabitants of any locality to serve upon a Local Board of Health? If all the inhabitants should decline to serve (and we know one instance wherein this contingency was upon the point of happening), who could legally make or enforce a rate? The past history of the Corporation of Edinburgh might also inspire caution in the minds of the creditors of bodies corporate.

Some of the remarks of the Vicar of Cirencester at the late Agricultural Meeting of the county of Gloucester, might also furnish the subject for reflection to those who are anxious to advance the true interests of our agricultural labouring population. The worthy Vicar protested, at the commencement of his speech, against the continuance of those ancient abominations, the Statute Fairs; but he dwelt more earnestly on the necessity which unfortunately exists for a radical alteration in the mode of construction of the dwellings for the poor. Indeed much of the misery, sickness, debauchery, and vice of the bulk of our labouring population must be attributed to the utter absence of any provision for the observation of the decencies of life in the hovels they are compelled to inhabit. The great difficulty, however, lies in this, that the wages paid to the agricultural labourers are not sufficient to enable them to rent decent dwellings. It is not possible to erect a cottage, or to build even a set of rooms adapted to receive a family, for less than £80; and it would be equally impossible to cover the interest of that outlay, to provide for depreciation, repairs, rates, and taxes, by a rental of 2s. per week. Now it is very rarely indeed that the collective earnings of a family in the purely agricultural districts would warrant even this small outlay, so that private charity, or the enlightened liberality of the landlords, must step in to remedy the crying evil. It is almost in vain to cleanse the streets, and to form sewers, so long as the homes of the numerous class we have referred to remain such sinks of squalor and wretchedness; and therefore it is that we would, like the worthy Vicar of Cirencester, urge the philanthropic Sanitary Reformers to turn their earnest attention to the "homes of the very poor." Even the partisans of the education of the labouring classes would find that the cause we seek thus to bring before them is intimately connected with the one they advocate. The best education a man can receive is one founded upon, and having reference to, home affections; but what affection can be felt for the wretched hovels which serve merely as dens to our hewers of wood and drawers of water?

By the way, our contemporary, the *Builder*, from whom we certainly expected more courtesy, has lately chosen to fall foul of us—firstly, because we defend the interests of gas companies; and, secondly, because we, some years ago, laughed at an

absurd notion for purifying gas, which had been patented by a Rev. Mr. Bowditch. Now we beg to remind our contemporary that accusations of the kind he has seen fit to make are particularly out of place in a country organized on the principles which prevail in England. We admit at once that the conductors of this JOURNAL have been professionally employed by Gas Companies, and have been paid by them for services rendered, just as *a certain* Mr. Godwin might have been had he been a Civil Engineer. But we deny that our editorial opinions are, consciously at least, influenced by our interests; and especially do we deny that any such motive influenced the remarks we made on Mr. Bowditch's abortive scheme. Our respected contemporary would have done more wisely had he taken the hint he seems to have read as addressed to Mr. Bowditch—"he should have stuck to his last;" for the remarks he has ventured to make on the subject of gas lighting are as little worthy of notice as are his sneers against ourselves. He evidently knows as much about gas making, or purifying, as he does about the history of that art, or about the rules of English grammar.

THE METROPOLITAN GAS SUPPLY.

THE question of Metropolitan Gas Supply is assuming a more business-like shape, and there is reason to hope that it will soon be removed from the heated atmosphere of misrepresentation and exaggerated declamation into the domain of common sense. Since our last number there has been a full meeting of the delegates, at which another long report from Mr. Hughes was presented; deputations have waited on the President of the Board of Trade, and on the Home Secretary, to endeavour to induce the Government to take the matter into their hands; and on Friday next the gas companies will state their case, so that the points really in dispute will shortly be brought fairly before the public.

At the meeting of the delegates the bill which they have given notice of their intention to bring into Parliament was discussed. The character of that bill we have already described, and the injustice and absurdity of most of its provisions are so manifest that we need not waste more time in noticing it, further than to observe that it provides for a districting arrangement similar in principle to that which the gas companies have adopted, and which was the cause of the clamour raised against them. Some of the delegates protested against the introduction of such a clause, as it was to oppose the principle of districting that they came there, but the Secretary declared that to omit that clause would "neutralize the entire object of the bill;" and so the districting arrangement which had previously excited so much violent declamation received the general support of the meeting. A petition in favour of the bill was approved of as a matter of course, and then Mr. Hughes submitted his voluminous report, in which he undertook to show, by very laborious calculations, that the proposed maximum prices of 4s. per 1000 feet for common gas, and of 5s. for cannel gas, would yield ample profit to the gas companies and ought to be adopted. We must do Mr. Hughes the justice to say that this report is one of his best; it exhibits much pains-taking and great ingenuity; but, like all his former statements and calculations, the results contradict his former opinions and prove there has been a great deal of labour in vain; for such conclusions as he arrives at might have been better obtained by a much simpler process, and they leave the whole question unsettled.

The propositions Mr. Hughes labours to establish are these:—he assumes, in the first place, that "there can be no doubt" that the sum of 4s. per 1000 feet of gas is amply sufficient in densely populated areas like the City of London, where, as he affirms, that price has been attended with "a constantly increasing profit" during the last ten years. In the next place, he attempts to show that the least populated districts of the metropolis may be supplied, with remunerative profit, at the lowest price now charged in the metropolis generally, because the Imperial Gas Company, which supplies such districts, divides nearly 10 per cent. on their capital. Having made these bold assertions he proceeds to inquire whether the maximum price of 4s. would enable the gas companies to pay a dividend of 10 per cent.; and after a preliminary compliment to the editor of this JOURNAL, he endeavours to show, by a comparison of the capital represented by £100 of gas rental, the great disproportion of the capitals of the London gas companies, and he estimates the profits of all the companies according to the least amount of capital invested by any one. The comparison of the rentals of the gas companies for every £100 of coal affords Mr. Hughes a fruitful source of calculation; and after deducting residual products from the general expenses of gas-making, he arrives at the net profits during the last five years of seven of the principal London companies, and from this he concludes that after the proposed reductions of price to 4s. and 5s., the average will be something more than the profit that was derived by the gas companies in 1854, at the present prices.

These calculations are, no doubt, highly ingenious; but as many of them are founded on erroneous data, they must be classed in the same category with Mr. Hughes's previous misrepresentations. His positive assumption, in the first place, that the supply of 4s. gas in the City of London has been attended with a constantly increasing profit, is notoriously incorrect. When the City of London Gas Company was compelled, by the competition of the Great Central, to reduce the price to 4s., their dividends fell to 3 per cent. per annum, and for several years it was with them a severe struggle for existence. At the meeting of the company in January last, the chairman expressed his belief that if clay retorts had not been introduced many of the companies would scarcely have been able to keep their doors open at all. During the time, also, that Mr. Hughes asserts there has been a constantly increasing profit, the Great Central Company, which was established with all modern appliances for the cheap manufacture of gas, has been compelled to reduce its dividends from 10 to 3 per cent., and is now only dividing 5; whilst the Chartered Company, the third one that supplies the City, make up their dividends by supplying a much more extensive district with gas at 4s. 6d. and 6s. per 1000 feet. As an example of the little dependence there is to be placed on Mr. Hughes's calculations, it may be noticed that, though only a small portion of the gas distributed by the Chartered Company is supplied at 4s., he adjusts the rental in comparison with that of the London Company, as if the whole quantity of gas was supplied at that price. With respect to the capital accounts of the various London companies, the difference between them is more apparent than real, for several of the companies—for instance, the South Metropolitan, the Chartered, the Equitable, the Imperial, and the Independent—have diminished their share capital by appropriating money available for dividends to improvements and extensions; therefore, when that circumstance is taken into consideration, the difference in most cases disappears.

Even assuming Mr. Hughes's statements and calculations to be correct, they only profess to give an imperfect account of the actual profits, for no allowance is made for the cost of distribution and management; and it seems eminently absurd to attempt by tortuous calculations and inferences to arrive at imperfect and fallacious conclusions, when the real facts are patent to every one who chooses to examine the companies' accounts. The yearly dividends are the best proof of the profits derived from gas-making, and these, it is satisfactory to know, present a great improvement in the general state of the metropolitan gas companies' affairs since 1854. This result has been produced by improved processes of manufacture, by low prices of raw materials, and, latterly, by the districting arrangements. The main question to be determined is, whether, under these favourable circumstances, the profits of the London gas companies are more than fairly remunerative for capital embarked in such undertakings. The amount of dividend sanctioned by Parliament in all recent gas Acts is 10 per cent. on the capital invested; and at the present time the dividends of the London gas companies do not average more than 7 per cent. This simple fact, which outweighs all Mr. Hughes's ingenious abstruse calculations, settles the point as to excessive profits being derived from existing prices.

The principal object of the deputations to the President of the Board of Trade and to the Home Secretary was to induce the Government to take the charge of bringing in a bill to regulate the gas supply of the metropolis, as the parochial contributions to the expenses of the threatened parliamentary campaign come in but slowly, and increased doubts are entertained of their legality. In the presence of the Ministers no allusion was made to the extravagant propositions contained in the bill prepared by the delegates to induce vestries and gas consumers to subscribe to the parliamentary fund. The spokesmen for the delegates limited their requests to the reasonable proposition that all the London companies should be placed under the Gas-Works Clauses Act of 1847, and that there should be a maximum price and a standard quality

of gas. The honorary engineer of the delegates and the chairman of the Marylebone meetings did, indeed, complain generally of anomalies at present existing in the gas supply of London and of the arbitrary conduct of the companies since the districting arrangements; and the honorary secretary, when Sir G. C. Lewis asked for proof of a grievance, repeated the refuted assertion that the gas companies exact for the public lighting £50,000 per annum more for the gas supplied than is charged to private consumers, but no member of the deputation made any specific demands for redress. Mr. Locke referred to the evidence taken before the parliamentary committee as making out an ample case for the interference of the Government, though he could scarcely have forgotten that two of the principal facts proved by that evidence were, the public advantage derived from the districting arrangement, and that the gas consumers represented by the honorary engineer were perfectly satisfied with the existing conditions of the supply of gas.

It has been the constant practice of the gas agitators to play fast and loose with their declarations of grievances, but the delegates must be prepared to stand by the assertion so often repeated, that the gas companies cheat the public to the extent of £50,000 per annum in the lighting of the street lamps, though it will bear a construction they probably did not anticipate. If the £50,000 per annum thus alleged to be fraudulently added to the revenues of the companies be taken away, the dividends will be proportionately diminished, and so much must be deducted from Mr. Hughes's calculations of the profits of gas-making. The correction, by Lord Redesdale's Act, of alleged fraudulent management of the meters must also have a similar effect; therefore, if the delegates maintain that their representations are true, it will be necessary, when the gas companies are forced to be honest, to compensate them by an increase in the price of gas to make their dividends remunerative, rather than diminish the present rates. As Mr. Hughes is a great logician, he cannot fail to perceive the force of this argument if he will not admit that he is convinced by it.

Among other assertions that had no foundation in truth, Mr. Beal told the Home Secretary that the gas companies had expended £6000 in resisting the measures of the parishes. This random assertion, after appearing in print, was assumed to be a fact, and one of the daily papers, taking for granted that it was so, proceeded to argue that the expenditure of so large a sum by the companies in defending their monopoly "shows that their profits from that monopoly must be very large." The fact is, that the money spent by the companies in meeting and rebutting the charges brought against them by the delegates from the metropolitan parishes did not amount to one-fifth part of the sum stated by Mr. Beal.

The responses given to the deputations by the President of the Board of Trade and by the Home Secretary were courteous and guarded. They very properly refused to express an opinion on the subject until they heard the statements on the other side; but Sir G. C. Lewis took the opportunity to read the deputation a lecture on the evils of competition among public companies; and he remarked also on the injurious effects of fixing a low maximum price on an article liable to fluctuation by variations in the price of the raw material. The interview with the gas companies is, we understand, appointed to take place on Friday next, when the intentions of Government will probably be made known.

As if to complicate the question of metropolitan gas supply, notices have been given of the intention to bring into Parliament next session bills for the formation of two new and separate gas companies, for lighting the northern districts of London. One of these companies, entitled the Borough of Marylebone Gas Consumers' Company (Limited), appears to be the company of last session revived. It is proposed to purchase land for the erection of the works either at Greenford, near Harrow, at Bow, or at Acton. The other company, under the title of the United Gas Consumers' Company (Limited), contemplate a more extensive range of operations, including Marylebone, St. Pancras, Paddington, Hampstead, Highgate, Islington, and Hackney. They propose to purchase land for the erection of works at Hammersmith. It seems doubtful whether either bill will actually come before Parliament, and the declaration of the Home Secretary against the competition of public companies, noticed above, will be a heavy blow and great discouragement to such speculations.

APPOINTMENT OF METER-INSPECTORS.

There seems to be some reasonable ground of apprehension that the valuable provisions of the Sale of Gas Act will be rendered nugatory by the manner in which the Act may be carried into operation. Whether it is to prove beneficial or otherwise will principally depend on the class of men appointed as inspectors of meters; and the resolution adopted on the appointment of the first inspector under the Act, as noticed in the last Journal, is not calculated to impart confidence in the authorities by whom such appointments are to be made. The gentleman selected by the Town Council of Londonderry to fill the important office of meter-inspector in that city is, for aught we know to the contrary, well qualified for the employment, and the local papers assure us that he is; but the low rate of remuneration given him indicates that the members of the Town Council have no adequate conception of the importance and responsibility of the office they have been so prompt to fill. The salary first proposed to be paid to the inspector was the miserable pittance of £25 per annum; but an amendment to that proposition, to the effect that the remuneration should be at the rate of *half the revenue* accruing from the office, was carried by a majority of one. As there are less than 2000 meters in use in Londonderry, it is evident that half the fees will amount to a very small sum, totally inadequate to remunerate any person for devoting his time and attention to the duties of the office; and it must necessarily be regarded only as an appendage to other occupations. In the case in question, the gentleman appointed is also inspector of weights and measures, to which there can be little objection, as the two occupations are of an associated character; but even that addition to his income is not sufficient for his respectable maintenance; therefore he is obliged to append to those two appointments other occupations of various characters. Amidst this multiplicity of avocations it is impossible that much time can be spared to the discharge of the duties of gas-meter inspector, nor can the Town Council expect it, considering the low estimate they form of the responsibility and importance of the office. This is not the way in which the provisions of the Sale of Gas Act can be satisfactorily carried out, and it is desirable to caution all local authorities who have the power of appointing meter-inspectors against following in the track of those who have been the first to put the Act into operation. The meter-inspectors ought to be a highly respectable class of men, and should be not only fully acquainted with their business, but of such a standing in society that their decisions will carry weight, and their characters should be a guarantee of their fairness and independence in the adjustment of disputes between gas companies and consumers. Such requirements cannot be obtained without the offer of sufficient inducement. We agree with a correspondent, who has directed our attention to the subject, that it would be better to allow the meter question to remain in its late unsatisfactory condition than to appoint inspectors who either cannot attend to their duty, or who are of inferior character and standing, and in whom neither gas companies nor gas consumers can place confidence. Our correspondent, a Scotchman, is of opinion that no salaries of meter-inspectors should be less than £200; but he suggests that a sliding-scale might be adopted, commencing at a salary of £150 for a town and district with 5000 meters; that the salary for a district with 10,000 meters should be £200; for 15,000 meters, £250; and for 20,000 meters, £300. We are inclined to think that these proposed salaries are rather under than above the fitting standard, especially for the larger number of meters, though we doubt the propriety of placing so many as 20,000 meters under the inspection of one individual.

The work should be effectually done or it had better not be attempted, and if, by ill-judged parsimony, the meter inspectors appointed should be an inferior class of men, the measure from which so much has been anticipated will prove a grievous disappointment. To obtain competent persons it will be necessary to give competent salaries, and, as this could not be done in small towns without a serious tax on the ratepayers, it is desirable that the local authorities in towns where there are less than 5000 meters in use should leave the appointment of inspectors to the county magistrates, who could then appoint district inspectors of gas-meters, at adequate salaries, whose duty it would be to visit their respective districts at fixed times.

Such an arrangement would be the most likely to secure the services of competent officers for the discharge of the important duties imposed on them by the Sale of Gas Act, on the proper performance of which the utility of the measure entirely depends.

Circular to Gas Companies.

THE November *Gazette* notices, preparatory to projected applications to Parliament, include eighteen affecting more or less the interests of gas companies. Some of them are of the usual speculative class resorted to by Local Boards when some point is to be carried by the exercise of undue pressure on a timid body of gas proprietors, and several of them will probably not reach the next stage, which involves the expense of preparing and lodging the copy of a bill. Such probably are those given by the local authorities of Brighton, Richmond, Macclesfield, and Oxford, and it is doubtful whether those given by the promotors of the two rival candidates for the honours and profits to be gained in a competition with the Imperial Gas Company in the Borough of Marylebone have any more substantial foundation than the excessive zeal of engineers, lawyers, and contractors to provide themselves with work. Upon this class of speculators even the lesson to be learnt from the experience of the last session in the summary rejection of the Marylebone Gas Consumers' Bill appears to be thrown away, although it is notorious that a large portion of the expenses incurred in promoting that bill are still unliquidated, and are likely to remain so, thanks to the Limited Liability Act, which in truth serves as a premium to dishonesty by protecting the promoters of bubble schemes when there are no funds for the payment of the expenses incurred.

The present promoters of these two projects will do well to reflect that there is no precedent on record since the passing of the Gas-Works Clauses Act in 1847 of parliamentary powers having been granted to any competing gas company where the company in actual possession of the ground was already under the *régime* of that Act. The Legislature seems gradually to have arrived at the conviction that competition between fixed capital was an illusion, and that Act was passed for the purpose of regulating the monopolies which gas companies practically possessed, although they were and still are liable to competition if they abuse or misuse their powers to such an extent as to induce the Legislature to interfere. The Imperial Gas Company adopted this Act in 1854, and the Governor of that company very justly observed at the last general meeting of the shareholders, in remarking upon the expenses incurred in opposing the last project, "this waste of money is much to be deplored, because the practical effect is that it postpones to an indefinite time that which we have so much at interest—a reduction in the price of our gas." The present projects are obviously put forward by speculators whose sole object is to cut out work for themselves, and we predict for them a repetition of the fate of the previous project should they ever reach the thresholds of the Houses of Parliament.

We append the notices *in extenso* as records of these schemes. The first is understood to be a revival of Mr. Kirkham's scheme of the last session, with two additional alternative sites. The second owns Sir Charles Fox as its author, and is based upon the extension of a small gas-work now in course of erection for lighting the Paddington Station of the Great Western Railway Company.

Borough of Marylebone Gas Consumers' Company (Limited).

(Incorporation of company, with powers to purchase land, erect works, lay down pipes, and supply gas to the borough of Marylebone and neighbourhood.)

Notice is hereby given, that application is intended to be made to Parliament, in the ensuing session, for an Act to incorporate the above company, and to authorize such company to manufacture, supply, and sell gas and coke; and also, to sell coals and other substances, for public and private purposes, within the parishes of Paddington, St. Marylebone, and St. Pancras, or some of them, all in the county of Middlesex, and to construct gas-works, with all necessary out-buildings and apparatus connected therewith, upon and within the limits of the following pieces of land, viz.:—

1. A piece of land belonging to Mr. Killingworth Hedges, situate in the parish of Greenford, in the county of Middlesex, and containing, by estimation, five acres or thereabouts, bounded on the north by the road leading from Greenford to the Harrow Road, on the south by the towing-path of the Grand Junction Canal, on the east by a field, the property of Mr. Gardner, and on the west by chemical works belonging to and occupied by Mr. George Fowler Perkin.

2. A piece of land belonging to the North London Railway Company, situate in the parish of St. Mary-le-Bow, in the county of Middlesex, and containing, by estimation, twelve acres or thereabouts, being part of a larger piece of land belonging to the said company, bounded on the north by the Lea Union Canal, on the south by a private road belonging to the said railway company, on the east in part by a wharf and land belonging to the said railway company, and in other part by land belonging to the trustees of the river Lea, and on the west by the Lea Union Canal, and by other lands of the said railway company, and which said piece of land on which the said works are intended to be constructed, is now in the occupation of the said company, their undertenant or undertenants.

3. A piece of land belonging to the London and North-Western Railway Company, and in part in the occupation of their lessee, situate in the parish of Acton, in the county of Middlesex, and containing eight acres or thereabouts, being part of a larger piece of land belonging to the same company, and which said piece of land upon which the said works are intended to be constructed, is bounded on the north by the London and North-Western Railway, on the south in part by the Grand Junction Canal, and in other parts by cottages and tar-works, the property of the said railway company, and in the occupation of their lessees or tenants, on the east in part by the same cottages and tar-works, and in the remaining part by Oak Common Lane, and on the west by other lands of the said railway company.

And it is proposed by the said Act to authorize the said gas company to purchase by compulsion or agreement the said several pieces of land, or any of them, and all other lands, houses, buildings, and property which they may be empowered to purchase; and also to cross, divert, break up, alter, or stop up, so far as may be requisite or desirable for the purposes of the company, any public or private streets, roads, ways, and places in the several parishes of Greenford, Harrow, Willesden, Acton, Hammersmith, St. Luke (Chelsea), St. Mary Abbots (Kensington), Paddington, St. Marylebone, St. Pancras, St. Mary (Islington), St. John (Hackney), and St. Mary-le-Bow, all in the said county of Middlesex, or any or either of them respectively, and to lay down and take up and maintain, for the purpose of giving such supply of gas as aforesaid, all necessary main pipes from the said several intended works, and all other necessary pipes and other works, and to demand, levy, receive, and take rates, rents, and charges for the supply of gas within the limits of the said intended Act, and for the hire of gas-meters and fittings, and to grant exemption from payment of rates, rents, and charges, and to have, use, and exercise all powers, rights, authorities, and privileges usually conferred upon gas companies, or which would be convenient or useful for enabling the said company to carry out the objects of its incorporation, and to confer, vary, or extinguish exemptions from the payment of any such rates, and all existing rights and privileges in any manner connected with the lands, buildings, and properties which may be purchased under the powers of the said Act, or which would prevent or interfere with the carrying into effect any of the objects or purposes of the said Act, and to confer other rights and privileges.

And it is proposed by the said Act to authorize contracts and agreements between the said company and any company, trustees, commissioners, vestries, or other public bodies, officers, or persons, with respect to the lighting of any public streets, roads, ways, or buildings, or which may be otherwise incident to their undertaking, or proper or convenient for carrying the same into execution, and to confirm all or any of such contracts and agreements as may have been entered into by or on behalf of the said company and other parties aforesaid prior to the passing of the said Act.

And it is proposed by the said Act to limit the price to be charged by the said company for the supply of gas, and the amount of dividend to be paid to the shareholders of the said company, and to appoint ex-officio directors of the said company from the vestries of Paddington, St. Pancras, and St. Marylebone, or one of them, and so far as may be necessary for the purpose last aforesaid, to alter or amend the Act 18th and 19th Vic., cap. 120, relating to the better local management of the metropolis, and the subsequent Acts relating thereto.

And it proposed by the same company to raise money by borrowing and by the creation of shares or otherwise for the purposes of the companies, and to regulate the capital thereof.

And notice is hereby given, that on or before the 23rd of December next, printed copies of the bill for effecting the objects aforesaid will be deposited at the Private Bill Office of the House of Commons.

Dated this 16th day of November, 1859.

United Gas Consumers' Company (Limited).

(Powers for supplying gas to Paddington, Marylebone, St. Pancras, and other parishes in the metropolis.)

Notice is hereby given, that application is intended to be made to Parliament, in the next session thereof, for leave to bring in a bill to enable "The United Gas Consumers' Company (Limited)" to supply gas for public and private purposes within the following parishes, or some part or parts thereof respectively (that is to say):—Paddington, Marylebone, St. Pancras, Hampstead, Islington, Hornsey, Stoke Newington, Highgate, Bethnal Green, and Hackney, all in the county of Middlesex.

The bill will, for the purposes thereof, confer upon the company the following, or some of the following, among other powers:—

To erect and maintain gas-works, with all necessary buildings, retorts, machinery, apparatus, and conveniences, upon the following pieces or parcels of land, or any part or parts thereof respectively, namely:—

(1.) Land in the parishes of Hammersmith and Fulham, in the county of Middlesex, or in one of those parishes, belonging to the trustees of the Catholic Cemetery, and as to part in the occupation of John Salter, and as to the other part (whereon a dwelling-house has been erected), and in the occupation of John Boultbee Vaughan, such land being bounded as follows; namely, on the north by the ground set apart and used as a Catholic cemetery, on the south by the Grand Junction Canal and the towing-path thereof, on the east by the wall separating it from land belonging to the Kensal Green Cemetery Company, and on the west by Mitre Lane.

(2.) Land in the said parish of Hammersmith belonging to the Great Western Railway Company, and whereon gas-works are in course of erection, such land having been formerly let on lease to John Boultbee Vaughan, and subsequently sublet to Henry Vavasseur, and being bounded on the north and the west by the Great Western Railway and works connected therewith, on the south and east by meadow land belonging to the said railway company, and in the occupation of Ann Elizabeth Ireland.

To purchase and hold land, and to take the same on lease, and to manufacture gas, and to sell and dispose of the coke and other residuum and products arising from such manufacture, and to lay down and maintain mains, pipes, and other works in, through, across, and under, and for that purpose to break up and interfere with streets, roads, lanes, and other public passages and places within the before-mentioned parishes, and within such parts of the parishes of Willesden, Hammersmith, St. Luke's, Chelsea, and St. Mary Abbots, Kensington, as may be necessary; and also to interfere with sewers, drains, water-pipes, and gas-pipes, within the limits of the bill, and within any of the parishes hereinbefore named.

To levy rates, rents, and charges for the sale and supply of gas, and the sale and hire of gas-meters and fittings.

To enable the company to contract and agree with any district board, vestry, or other public body, for and with respect to a supply of gas for public purposes, and in like manner to contract and agree for supplying gas to any railway or other company, and to confer upon any such district board, vestry, or other public body, and upon any such railway or other company, all necessary powers for enabling them to enter into and fulfil any such contract or agreement; and to this extent the bill will or may amend the Act or Acts relating to any such company.

To incorporate with the bill all or some of the provisions of "The Gas-Works Clauses Act, 1847," and, if need be, to amend "The Metropolis Local Management Act, 1855," and of any local and personal Acts in force within any part of the limits of the said bill.

To confer upon the company other rights and privileges, and to vary and extinguish all such existing rights and privileges as may be necessary in the attainment of any of the objects of the bill.

Printed copies of the proposed bill will be deposited in the Private Bill Office of the House of Commons on or before the 23rd day of December next.

Dated this 19th day of November, 1859.

ASHURST, SON, and MORRIS, 6, Old Jewry,
Solicitors to the Bill.

The arguments on the rule *nisi* granted in the case of *Hills v. the London Gas Company* are terminated, and the judgment of the court as to whether there is to be a nonsuit or a new trial, or whether the Kingston verdict is to stand, will be pronounced next term. Under these circumstances we refrain from any further observations on the case.

Communicated Articles.

SICK AND SUPERANNUATION FUNDS.

In offering some remarks upon these points, we presume that it is now an agreed axiom that kind treatment and good and just usage of workmen is eminently to be cultivated; and the employed should be bound to the employer by the silken cords of regard and esteem, while he should feel perfectly convinced of his continuous employment during good conduct, and so long as health and strength remain to him. In the manufacture of gas, the public owe their beautiful light, and the shareholders owe the item of profit on their capital, entirely to the application of manual labour, to the exclusion of the use of machinery. In the metropolis, the coals are worked out of the ship by eight human jumping weights counterbalancing a coal basket. The coals are frequently borne into the retort-house on the backs of porters. The coals are placed in the retorts by hand labour, drawn by the same means, and the resulting coke finally filled into sacks and loaded away in a similar way. Now that the steam-engine is employed successfully to weave the most delicate patterns in silk, in worsted, in cotton, or in linen, it seems disgraceful that we can only use power to pump off the manufactured gas, or to pump up tar or water, or at some places to stir up the cream of lime.

The hot work of a retort-house is of the most exhaustive and even enervating character, while the violent exposures to heat and cold, and the loss of weight from excessive perspiration, certainly do not tend to promote health.

Well, we will suppose the case of a gas-work where everything has been done for the stokers that can be done. Spirits and strong beer are never allowed within the gates; "skilly," or thin gruel, is given away gratis during drawing; the intervals of labour are sufficient to allow time for meals and for rest; the retorts are not set so that the work has to be done between two furnaces, neither are any retorts set so high as to strain the men in charging; the workmen are not bullied by tyrannical engineers, superintendents, or foremen; the hiring is for six days per week only, at so much per day, while those willing to work on the Sunday are paid at the same rate per day, together with so much per day extra; the alternating change from night to day work is duly maintained; cleanliness (the virtue next to godliness) is insisted upon, and the men are restored to their homes freed from the pollution of coal dust and sweat, more beloved by their wives and children, and more self-conscious of purity and respectability; the children are provided with schools, where they are instructed in moral and religious knowledge, and in industrial pursuits; a doctor is provided during sickness gratis, or dispensary recommendations or hospital letters are given away. Well, we will suppose all these things done, there still remains sickness and old age to be relieved and alleviated. The improvident stoker, receiving 28s. per week, subscribing to no club, falls sick, and after a fortnight's illness has to apply to the parish, and is offered the "house," with the break up and sale of the furniture of his little home, or to receive a weekly dole of bread which will not keep body and soul together. Again, a strong, hearty young man entering as a stoker at twenty-five, finds himself at forty-five only capable of doing cokeman's work, and is at sixty bent double with premature old age; and, incapable of work, he betakes himself to the workhouse to await his death.

Now this should not be. It has been found (notwithstanding the apparent unhealthiness of the work above mentioned) that the average of men always sick does not exceed 3·75 per cent. One of the schemes proposes that no man be continued as a workman unless he subscribes sixpence per week to a sick-fund. An objection will be raised at once to any system of "compulsory" payments. But when it is borne in mind that it is no hardship upon the provident, who will of course subscribe to a sick-club somewhere; that in the rules proposed the management of the funds is entirely vested in the workmen themselves; that the principle of the "Birmingham" Club, or the division of the balances every year (such a favourite scheme with workmen), is adopted; that the improvident, falling on the parish in every sickness, are a disgrace to themselves, to their fellow-workmen, and to the "shop" they work for; and that in general the improvident are neither good, nor honest, nor trustworthy workmen, we apprehend the "compulsory system" will hardly be seriously objected to. But to return to figures. The receipts will amount to 50s. per week per 100 men. The payments to the sick will be 35s. per week, leaving a balance of 15s. per week, or, at the end of the year, £40 or 8s. per man to be divided. There is a little difficulty in men belonging to other clubs. It has been found that men have sometimes received 30s. per week for being ill and idle, while they have only received 26s. per week for hard work. (Who would not, then, be idle?) This is met by refusing them any allowance when sick, but giving them a fixed dividend of 20s. at Christmas, thereby calling upon them to contribute 6s. per annum towards their sick fellow-workers' support, funeral-fees for themselves and all. There is another difficulty with the extra hands entering in the autumn. The rules propose that from their dividend (if any should remain) there should be deducted for the maintenance of the sick threepence per week for the period of the year previous to their employment. Thus, a man first engaged on 1st September would have to contribute for thirty-five weeks at threepence, which would absorb all his dividend.

Again, with those who are dismissed for slackness of work in the spring, they would receive the dividend then remaining in hand. The casual workmen employed at any odd intervals between one Christmas-day and another would have to contribute towards the fund, and in case of sickness would receive an allowance, or, in case of death, his wife would receive the burial fees; but otherwise he would be uninterested in the fund. Whenever a workman has met with an accident *bonâ fide* in the execution of his work, he is usually allowed for a limited period half-wages, and of course he would receive his sick allowance from the club.

It will be borne in mind that the system of insurance is of the most favourable description, inasmuch as an engineer or superintendent or foreman, upon introducing new workmen, will, for his own sake, only engage the young, the able-bodied, the strong, and the healthy; and as soon as ever they cease to answer that description, they are discharged. Upon this point it may be remarked, that in some works it is desirable to make provision, to absorb into some other kind of labour, lamplighters exceeding thirty years of age; after that age they are not so capable of "running like a lamplighter," while a lad of fourteen or sixteen, who is steady and punctual, will do the work much quicker, and be satisfied with much less wages. But to return to the proposed sick-club, the collection of the weekly payments, the distribution and management of the funds, and the control of the sick are all entirely vested in the workmen. This is a point upon which they are particularly tenacious. The money is their own, and they are quite shrewd enough and clever enough to be able to manage it to the best advantage. The only limitation is that the superintendent has a veto power upon the decision of the majority in regard to the expulsion of any member, to prevent any personal injustice from feelings of spite. The fund, too, is placed in the hands of the chief officer, and it is no shadowy fund "looming in the distant haze," with scarcely a certainty whether it does not form part of the company's general funds; and, doubtless, without the slightest idea that any person is in the least degree interested as to whether it is large or small. No, it is a real, substantial, tangible fund, in which every one feels deeply interested, and the exact amount of which every workman will ascertain and feel the benefit of as he delightedly places the dividend in his pocket to buy a Christmas dinner.

Upon this point perhaps a deviation may be made to suggest that the night and day workmen's and the lamplighters' wages should be paid not later than Friday evening at six; that the separate cash should be placed in the workmen's *own* hands, by the superintendent or other confidential officer, and should not be entrusted to a foreman to pay in gangs, as such man may avail himself of his position to make agreements with the neighbouring publicans to make stoppages for beer score.

Next, as to the superannuation-fund, it has been proposed in certain cases that the entire fund should be contributed by the company; that the number of superannuation allowances should be 2½ per cent., or five allowances for every 200 men employed at Christmas. This, at 10s. per week, will cost about £65 per annum for every 100 men. This will probably cost 2 per cent. on the amount of the wages, or perhaps ·25 per cent. on the amount of the rental. If at any time there are more candidates than there are vacancies, the more recent candidate will have to wait (as for an almshouse) until a vacancy occurs. Again, if there are fewer candidates than allowances, the unclaimed surplus will be added to the sick-fund, and it will be divided at Christmas with the general balance. This will excite an interest amongst workmen to prevent any candidates from coming on who are not eligible, and also

tend to prevent disappointment or complaining if the number of vacancies should appear too few for the number of candidates. The few that will reach to sixty years of age, after so many years of continued employment, are not likely to yield an enormous number of candidates.

It is argued that a trifling pension may well be bestowed upon an old servant who has worked the best of his days and for twenty years for a company, and that without in any degree pauperizing him. It is sad to see such men constantly closing their days in workhouses; and there appears no occasion to give them the very highest wages and then call upon them to create a permanent and increasing fund (in which they feel no interest) for the purpose of pensioning off a generation of unborn stokers.

It is unnecessary again to urge the expediency of uniting together in the closest bonds the employers and employed, and to remind the employers that the inducement of a superannuation-fund will tie down the workmen to the shop; and the leaven of a few men actuated by so reasonable and legitimate a motive will tend to leaven the other workmen.

Correspondence.

APPOINTMENT OF METER-INSPECTORS.

Sir,—If Londonderry has taken the initiative in appointing an inspector under Lord Redesdale's Sale of Gas Bill, Liverpool, with the promptitude which characterizes her proceedings in the very important subject of gas lighting, followed closely. On the 9th of last month, after the compulsory one month's notice, the council adopted the provisions of the bill by appointing Mr. Horton to the inspectorship. This step was merely a matter of form, no change whatever being introduced, as Mr. Horton has filled the situation for about three years under the corporation. Liverpool is the only provincial town in which an inspector of gas and meters has been at work, and if the Act is equally successful in other towns in the country where gas is used, a greater benefit will be derived by the public than from many Acts of Parliament professing greater good. But there is probability that in many small towns inspectors will be appointed who know nothing whatever about the construction of meters or the constituent parts of coal gas, and magistrates, town councillors, and others having inspectorships at their disposal would do well to appoint one of scientific knowledge and practical acquaintance with gas and meters, for on that, without doubt, the success of the bill depends. Take Liverpool as a criterion, and it is found that during the three years Mr. Horton has held the appointment, fulfilling all the requirements of the Act, and indeed doing more, there has not been a single complaint that was not promptly and speedily arranged to the satisfaction both of the gas consumers and the gas company.

When it is stated that Mr. Horton has done more than fulfil the requirements of the Act—*i.e.*, the testing, stamping, and superintending of meters—reference is made to taking the pressures in the mains in the different streets, checking the registration of the meters in the corporate establishments, regulating the pressures to the public clocks, &c., making tests of the illuminating power, and attending to various other matters necessary to the proper lighting of a town. Every town in the kingdom cannot get an inspector, in point of qualifications for the office, equal to Mr. Horton, but they can find men, at all events, practically acquainted with the subject. Magistrates and others would confer a boon, and further the public weal, by appointing, not only properly qualified men to carry out the Act, but inspectors who would be able to perform similar duties to those carried out in Liverpool. Let them inquire into the working of the office referred to, and they will find that the aptitude and ability of Mr. Horton for the situation has made Liverpool not only the best regulated and with fewer complaints, but, in gas matters, a model for other towns to study.

Perhaps yourself or some of your correspondents can inform me through your Journal, whether a superintendent has been appointed at Westminster to stamp and give out the models and other testing apparatus; if movements have been made in any districts or towns to adopt the Act, and what attention has been given to installing inspectors with the qualifications suggested in this note; and also, whether town councils are justified in awaiting the receipt of testing apparatus before appointing inspectors? The latter question is asked by several appointments being delayed, from the wording of the 2nd clause of the Act. A.

Liverpool, Dec. 1, 1859.

Register of New Patents.

1244.—George John Parfitt, of Bath, city surveyor, for "*Improvements in gas-burners.*" Patent dated May 20, 1859.

All argand burners hitherto made and used for the consumption of gas have been drilled or perforated vertically, or at any angle from the top of the burner, the effect of which is, that the gas is forced out through holes drilled or perforated at the top of the burner, and consequently the flame rises perpendicularly.

This invention consists in drilling or perforating a hole or holes in the argand or other burners from the inside of the inner tube or gas chamber of the burner in a direction horizontal, or at any angle that will allow the gas to pass and meet at a point or points in any direction, or as is hereinafter described, so as to produce the flat light known as the fishtail.

The invention also consists in a perforated or porous cone or tube, of any shape or size, to regulate the supply of oxygen from the air, so as to render combustion perfect and complete, with the consumption of a less quantity of gas. Also in a tap or cock of any shape or size, the plug of which has a hole or holes drilled or constructed through its centre for the purpose of admitting only such a quantity of gas to pass to the burner as can be consumed, so as to give the greatest amount of illuminating power. Also of various perforated or porous plates to be placed inside of the plug, or within any portion of the tap or cock, according to its size and form, and to be so packed with horsehair or other material so as to allow the gas to pass through free of noise at any pressure. The said tap or cock is constructed either with flanges or male and female screws, as the case may be.

The invention also consists of a perforated or porous plate or plates of wire gauze for regulating the quantity of oxygen from the air that may be brought to bear by the side of the light or around it, so that it may surround the flame and render combustion perfect. Also in a burner to be used with or without a glass, upon the same principle as above stated, having a hole or slit or open space in its centre, with one, two, or more holes, as the case may be.

The invention may be applied to safety or other lamps by placing two or more wicks so as to burn in juxta-position with each other at a horizontal or other angle, the object being to produce a greater degree of light with a less consumption of oil, photogene, or other inflammable matter. In this case the aforesaid cones or tubes are applied to the centre, or betwixt the wicks and the plate or plates to regulate the quantity of oxygen from the air to cause combustion. The invention can also be applied to cooking stoves and boilers of any description; also for heating hothouses, &c., as by perforating the cone or tube to a greater or less extent a corresponding degree of heat may be obtained. In connecting the tube and burner with stoves, boilers, &c., an apparatus with a spring and plug is employed, so that, in case of accident by the tube becoming disconnected, all escape of gas may be prevented.

The claims are—

1. The peculiar modification and arrangement in the construction of gas-burners.

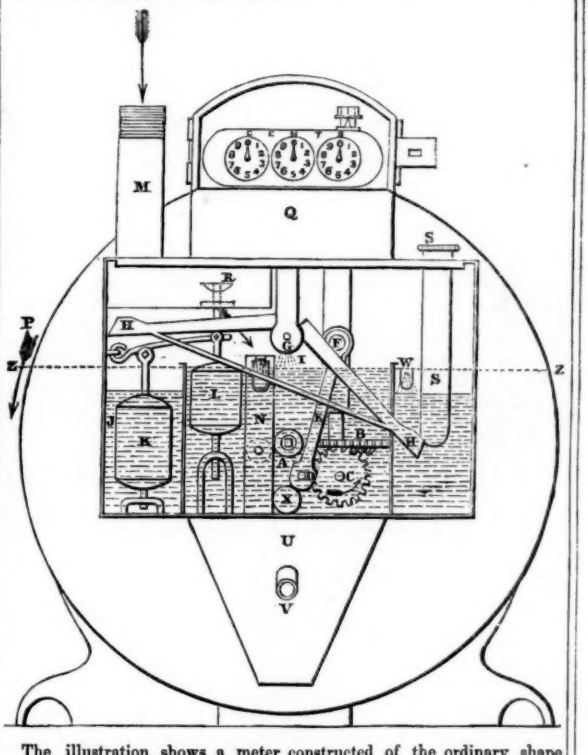
2. The peculiar form of tap or cock to supply the exact quantity of gas required to produce perfect combustion in conjunction with the aforesaid burners.

3. The application of the perforated cone or tube and the perforated or porous plate or plates of wire gauze for directing, allowing, and admitting the exact quantity of oxygen from the air to cause perfect combustion.

4. The kind of glass or glasses and reflector adapted to the aforesaid burners.

1308.—James Corn Bent, of Birmingham, gas-meter manufacturer, for "*Improvements in gas-meters.*" Patent dated May 26, 1859.

This patent has for its object the maintaining of a constant water-line in the meter, which is effected by means of a balance-lever, with a scoop at each end for alternately lifting the water from a spare reservoir into the measuring-chamber, the elevated end forming a counterpoise with the lower end, so that the small quantity of water contained in the scoop is all that is absorbing power in its elevation.



The illustration shows a meter constructed of the ordinary shape with a view of showing that the meters now in use may be readily altered or fitted with these improvements at a trifling cost. The front plate is removed for the purpose of showing the interior or the supplementary reservoir for keeping up the supply of water to the

measuring-chamber or water-line in the body of the meter, with which the chamber J is in connexion, and which part has also its front removed. A is the front axis of the measuring-drum, on which a worm-wheel is placed, which gives motion to the horizontal wheel B, which, having a bevilled wheel on its under side, gives motion to the corresponding bevilled wheel marked C, on which a crank pin D is fastened, which gives motion to the arm E, and this arm is connected with the crank-pin F, and which crank is in connexion with the arm G, to which the balance lever H H is fastened; and as the distance from the centre of the wheel C to the crank-pin D is much shorter than the centre of the crank-pin F is to the centre G, it is evident that while the crank-pin D is continually moving around in the direction of the arrow, the crank-pin F will be lifted up and down through the segment of a circle shown in dotted lines, at the same time alternately vibrating the balance-lever HH, the ends of which, being hollow, as at H', a small quantity of water will be elevated with it, which, when passing up above the horizontal line, the water it contains will run towards the centre, and backward over a lip into the measuring-reservoir or water-line, as at I. The broken dotted lines crossing the several parts in this chamber represent the water, and the same description of lines, as at J J, represent the water in the supplementary chamber. K and L are balance-floats, one working in the supplementary chamber and the other in the measuring or water-line chamber, but both are connected to the same lever for keeping the valve open through which the gas is emitted into the meter through the supply-pipe, M; and, for example, it may now be supposed that it is entering the meter and descending the tube N to the dotted circle O, where it passes at right angles into the body of the meter, exerting its force in the compartments of the drum above the water-line, causing it to turn in the direction of the arrow P, and by the pressure of the gas acting on this drum the several parts are put in motion, as before described, from the worm wheel on the axis, A; and, as long as the gas is turned on, the parts will continue to work, and by the revolution of the wheel B, a train of wheels behind the dial Q is put in motion, operating on the hands by which the quantity of gas passed through the meter will be duly indicated. Also, it may now be supposed that from evaporation the water in the supplementary chamber has been used up; the consequence will be, that the balance float K will descend, and thereby close the valve, marked R, shown in dotted lines, and cut off the supply of gas, thus indicating the condition of the meter, which the patentee now remedies by opening the water-way S, and adds a supply of water, which he may do until the meter is gorged or over-supplied with water, so as to cut off the supply of gas to the drum by causing the water to flow over the lip T of the tube N, down which it will flow to the waste water-box U, until it rises above the supply-tube shown in dotted lines at O, which will cut off the escape of the gas from passing to the drum, and this state or condition is easily rectified by removing a screw-plug from the little waste-pipe V, which will allow all surplus water to flow out until the water in the reservoir J is as much below the water in the measuring-reservoir I as the lip T of the pipe N is below it, thus leaving the meter in proper condition for work, which it will continue to do until, as before described, the supply for the evaporation which is constantly going on has exhausted the supply-chamber J; and, as the scoops will take up more or less water at each alternate elevation, according to the depth or quantity of water in the reservoir J, than may be required, an overflow-pipe is provided, marked W, the lip of which, being set to the exact position or desired level of the water-line in the measuring-chamber or body of the meter, as indicated by the dotted lines Z Z, will allow the surplus supply to flow back again from the measuring-chamber into the reservoir J. This pipe the inventor prefers making of soft metal, which enables him to elevate or depress it in order to arrive at the desired adjustment before soldering up or fixing on the front plate; and in order that the water shall not be throttled or confined in the water-line chamber from the true measuring-chamber in the body of the meter into which it first enters from the supply-pipe S, a hole is formed through the back of the water-line chamber into the body of the meter, as at X.

The patentee does not confine himself to any of the exact details herein described and exhibited, as the whole are capable of considerable modifications and applicable to all sized meters, without departing from the spirit of his invention,—as, for instance, the lever H may be weighted and closed up on one end so as to form a counterpoise for the other, which may be confined solely to the elevating of the compensating water,—but what he claims and wishes protected by these his in part recited letters patent is the application (for the purpose of maintaining the water-line of the measuring-chamber of wet gas-meters) of a balance-lever as herein described and exhibited, marked H, and also the arrangement of the floats K and L, as herein described.

1287.—James Harmer, of St. James's Street, Lower Road, Islington, in the co. of Middlesex, for "*Improvements in parts of dry gas-meters.*" Patent dated May 25, 1859.

These improvements relate to the crank, and parts in connexion therewith, for giving motion to the valves to facilitate adjustment thereof, and of the valves.

For this purpose the crank-pin, which by links or arms gives motion to the valves, is formed of an increased diameter in relation to the crank axis or part thereof, so that the eyes or holes in the ends of the links connected thereto may freely slide over such axis or part thereof and on to (*sic*), so as to fit without shake such enlarged crank-pin without the necessity for slitting or otherwise opening such part of the connecting links or arms as is the general practice, for the purpose of getting these connecting links or arms on the crank-pin, as well as giving facility for the use of connecting links of stiffer and thicker metal, and the application of washers between them; and these links are retained in position, if required, by a collar, or washer and pin, or such like means.

1314.—Léon Farrene, gentleman, and Bernard Subra, Professor of mathematics, both of Paris, for "*Improvements in gas lighting by means of direct carburators.*" Patent dated May 27, 1859.

The claim is for—

1. Providing each burner or a set of burners fixed on the same chandelier or gas apparatus with a napthalizing or carburating apparatus.

2. Causing the gas to impinge on or strike against the surface of the carburating liquid, it being preferable to have the gas divided into several jets by a rose or other suitable means.

3. Having a regulator or arrangements for regulating the distance between the rose from which the gas issues and the surface of the carburating liquid on which the same has to impinge.

4. Having a stop-cock interposed between the burner or burners and the carburating apparatus for regulating the exit of the gas and the vapour of the carburating liquid.

5. Annexing a carburating apparatus to a gas-meter, and making the motion of the drum of the latter subservient for driving the moving parts of the carburating apparatus

6. The peculiar arrangement and construction of parts of the above-described apparatus.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

2359.—Robert Smith, of Islington, London, shipowner, for "*The purification of water and other fluids.*" Oct. 15, 1859.

2512.—Frederick Hale Holmes, of Northfleet, Kent, professor of natural philosophy, for "*Improvements in apparatus for transmitting light.*" Nov. 4, 1859.

2588.—Charles Chalmers, of Merchiston Castle, Bank Morningside, Edinburgh, N.B., gentleman, for "*Improvements in gas-stoves for heating buildings, apartments, and other similar places.*" Nov. 15, 1859.

2598.—William Johnson, of 47, Lincoln's-Inn-Fields, London, and 166, Buchanan Street, Glasgow, N.B., civil engineer, for "*Improvements in gas-burners.*" Nov. 16, 1859.

2613.—James Pinchbeck, of Camden Street, Islington, London, for "*Improvements in consumers' compensating gas-meters, which are partly applicable to ordinary consumers' meters.*" Nov. 18, 1859.

NOTICES HAVE BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

2334.—William Prosser, of 24, Dorset Place, Dorset Square, Middlesex, for "*Improvements in apparatus employed in the production of light.*" Oct. 13, 1859.

2424.—Andrew Limnere Dowie, of Glasgow, N.B., merchant, for "*Improvements in gas-burners, and in pressure-regulating apparatus for the same.*" Oct. 24, 1859.

2505.—George Wemyss, of Springwood Park, in the co. of Roxburgh, N.B., gardener, for "*Improvements in ventilators.*" Nov. 4, 1859.

2574.—Marc Antoine François Mennons, of 39, Rue de l'Échiquier, Paris, for "*Improved apparatus for the concentration, distribution, and application of the heat evolved by gas, oil, and other lamps.*" Nov. 14, 1859.

Parliamentary Intelligence.

NOTICES GIVEN FOR GAS, WATER, AND IMPROVEMENT BILLS.

SESSION 1860.

Gas Bills.

Blackburn Gas.—Increase of capital; amendment of Act.

Borough of Marylebone Gas Consumers' Company (Limited).—Incorporation of company, with power to purchase land, erect works, lay down pipes, and supply gas to the borough of Marylebone and neighbourhood.

Dartford Gaslight and Water Company.—Incorporation of company; construction of additional gas-works; purchase or transfer of existing gas-works; purchase or lease from Local Board of Health of existing water-works; power to complete same; and other purposes.

Dover Gas.—Repeal of Act; reincorporation of company; increase of capital; power to sell water to Local Board of Health, &c.

Droylsden Gas.—Incorporation of company; continuance of gas-works; supply of gas; extension of limits of supply; contracts with public bodies, &c.

Highbridge Markets and Gas.—Incorporation of company; supply of gas to Highbridge and neighbourhood; and other purposes.

Leicester Gas.—Increase of capital; reincorporation of company; definition of limits of supply; amendment or consolidation of Acts.

London Metropolitan Gas Regulation.—For regulating the price and quality of gas within the metropolis; alteration of rates; amendment of Acts; and other purposes.

Macclesfield Gas Supply.—Supply of gas to Macclesfield and the neighbourhood by Macclesfield Local Board of Health; purchase of Macclesfield Gas Company's undertaking; new and extended gas-works, new and altered rates on borough, and for supply of gas; power to raise money; amendment of Acts.

Mirfield Gas.—Incorporation of company; power to maintain and improve existing works, to supply gas, to break up streets, roads, and highways, and to charge rents.

Torquay Gas.—Incorporation of company, with powers to construct gas-works, and to supply gas, &c., within the parishes of Tormoham, St. Mary Church, and Cockington, or some or one of them; powers to construct road or approach to gas-works; powers to purchase lands for those purposes; powers to let undertaking; powers to purchase, &c., undertaking of existing company.

United Gas Consumers' Company (Limited).—Powers for supplying gas to Paddington, Marylebone, St. Pancras, and other parishes in the metropolis.

Widnes Gas and Water.—Incorporation of company; construction and maintenance of water-works and gas-works; purchase of lands; levying rates; capital.

Water Bills.

Alverstone (Isle of Wight) Water-Works.—Incorporation of company for supplying with water Sandown, Lake, Shanklin, and other places in the parishes of Brading, Shanklin, and Newchurch, and places adjacent in the Isle of Wight.

Bedford Water-Works.—Incorporation of company; construction of works for the supply of water to Bedford and the neighbourhood.

BELPER WATER-WORKS.—Incorporation of company; construction of works, &c.

BLACKBURN AND DARWEN WATER-WORKS.—Powers of sale; purchase and amalgamation of undertakings of the Blackburn Water-Works Company and Darwen Water-Works and Reservoirs Company; capital arrangements; power to construct new works; extension of limits of supply; amendment of Acts.

BRIGHTON WATER-WORKS.—Incorporation of company; construction of works; levying rates, &c.

BROMPTON, CHATHAM, GILLINGHAM, ROCHESTER, AND STROOD WATER-WORKS.—Incorporation of company; construction of works; and other purposes.

CARDIFF WATER-WORKS.—Construction of works; purchase of land; extension of district; raising further money; and amendment of Act.

COLN RIVER WATER-WORKS.—Incorporation of company for supplying Staines, Hounslow, Ealing, Acton, Hanwell, and other places with water; and for other purposes.

CONSETT DISTRICT WATER-WORKS.—Incorporation of company; construction of works; supply of water to Consett and other places.

HASTINGS AND ST. LEONARD'S WATER-WORKS.—Incorporation of company; construction of works; supply of water.

HOLYHEAD WATER-WORKS.—Incorporation of company; construction of works, &c.

LISKEARD WATER-WORKS.—Construction of works and supply of water; arrangements with Liskeard and Looe Union Canal Company and others; and other purposes.

LIVERPOOL CORPORATION WATER-WORKS.—Additional reservoir and works; alteration of rates; conversion of debt; amendment of Acts; and other purposes.

MAIDSTONE, ROCHESTER, CHATHAM, BROMPTON, GILLINGHAM, STROOD, AND AYLESFORD DISTRICT WATER-WORKS.—Construction and maintenance of works; amendment of Acts.

MAIDSTONE WATER.—Construction of works for supply of water; and other purposes.

MANCHESTER CORPORATION WATER-WORKS.—Alteration of provision as to discharge of water down the river Etherow; additional money; amendment of Acts; and other purposes.

MATLOCK WATER-WORKS.—Incorporation of company; construction of works, &c.

MEDWAY VALLEY WATER-WORKS.—Incorporation of company for supplying Maidstone, Rochester, Chatham, and other places in Kent, with water; with power to purchase by agreement any existing works.

NORTH KENT WATER-WORKS.—Incorporation of company for supplying Dartford, Crayford, Plumstead, Eltham, and other places in Kent, with water.

PLUMSTEAD, WOOLWICH, AND CHARLTON WATER COMPANY.—Incorporation of company to supply Plumstead, Woolwich, and Charlton with water; power to purchase undertakings of the Plumstead, Woolwich, and Charlton Consumers' Pure Water Company, Limited, and to those companies to sell; powers to maintain works; levy rates; and for other purposes.

RYDE WATER.—Construction of works and supply of water; amendment of Acts; and other purposes.

SHEFFIELD WATER-WORKS.—Additional share and loan capital; extension of limits of supply; extension of time for completing works; purchase of lands by agreement; provision for sale or lease of sites of disused works and surplus lands; amendment of Acts.

SPALDING WATER-WORKS.—Incorporation of company; construction and maintenance of works; supply of water, &c.

WAKEFIELD GRAVITATION WATER-WORKS.—Construction and maintenance of works; power to lease or sell such works to the corporation or Local Board of Health, or to sell to or amalgamate with the Wakefield Water-Works Company.

WELLINGTON (SALOP) WATER-WORKS.—Incorporation of company; power to maintain works for water supply; increase and regulation of capital; and further powers.

WEST MIDDLESEX WATER-WORKS.—Increase of capital; amendment of Acts.

WIGAN WATER-WORKS.—Abandonment of portion of authorized works; new reservoir and other works; reduction of compensation waters; acquisition of market and other rights; compulsory purchase of lands; amendment of Acts.

Improvement Bills.

ABERGAVENNY IMPROVEMENT.—Amendment of Act; construction of water-works; conservation of stream; lighting.

BRIGHTON IMPROVEMENT.—To provide gas and water, and purchase works of existing gas and water companies.

HEDON CORPORATION AND BOROUGH IMPROVEMENT.—Supply of gas, and purchase of gas-works.

HUDDERSFIELD IMPROVEMENT.—GAS-WORKS.—Powers to purchase works of the Huddersfield Registered Gaslight Company at Huddersfield, and the site thereof; to extend and maintain the same and supply gas; to borrow money; repeal and amendment of Acts.

MANCHESTER IMPROVEMENT.—Purchase of lands for widening streets; for gas-works and for general improvements.

OXFORD LOCAL GOVERNMENT.—To authorize the commissioners to buy, and the University and city to sell their water-works; to contract with any gas company for the supply of gas for the streets, or to erect gas-works.

RICHMOND IMPROVEMENT.—Appointment of commissioners for general improvement of the town and parish; power to supply gas and water, and to purchase existing works; amendment of Acts, &c.

SWANSEA LOCAL BOARD OF HEALTH.—Improved water supply; power to Local Board of Health to construct reservoirs and conduits and other works; abandonment of works authorized by "Swansea Local Board of Health Water-Works Act, 1852;" power to levy water rates and rents, and to alter existing rates or rents; power to supply water out of the district (of the Local Board); amendment and repeal of Acts.

Legal Intelligence.

COURT OF EXCHEQUER.

WESTMINSTER.—MONDAY, NOV. 21.

(*Sittings in Banco, before the* LORD CHIEF BARON *and Barons* BRAMWELL, CHANNELL, *and* WATSON.)

HILLS *v.* THE LONDON GAS COMPANY.

This was the day specially appointed for hearing the arguments against that portion of the rule which had been obtained to show cause why a new trial should not be granted on the ground that the verdict was against the weight of evidence *.

Sir FITZROY KELLY, in opposing the rule, said he ventured to express a sincere and earnest hope that this case was verging towards its final conclusion. He had to address his arguments to the question whether the verdict was against the weight of evidence. His learned friend, Mr. Bovill, said he must not take it that that was the only point. There were, certainly, two or three important points of law in the rule, but these had been already argued and disposed of by the court, and those which arose upon the face of the patent were such that he thought, upon the mere statement of them, their lordships would relieve him from further dealing with them. But it was a most important question whether, upon the principles which governed the court in dealing with matters of this nature—*i. e.*, on applications to set aside verdicts on the ground that they were against the weight of evidence—this verdict could be disturbed. It was not, therefore, *ad misericordiam* but *ad justitiam* he now stated that this cause was once tried at *nisi prius* in this court, that it was once before Lord Campbell in the Court of Queen's Bench, and that it had subsequently undergone a trial of five long days at the assizes at Guildford. The learned judge on the last occasion having, without the least hesitation, at the instance of his learned friend, and in order to avoid the possibility of a new trial under any circumstances, reserved every point which could even be suggested, then addressed the jury, and expressed his earnest hope that at all events, as far as regarded a trial before a jury, the case would be concluded there and then. His lordship, adverting to the great time the case had occupied, and the many points made by the plaintiff principally upon the evidence, said he would to the best of his ability so charge the jury upon the whole case, that it should be quite impossible it should ever need to be submitted to another jury. He (Sir F. Kelly) need not remind the court of the principles so recently urged upon and adopted by them as governing applications of this nature—that it was not even if one or more members of the court should take a different view of one or more of the points which arose in the case, that the verdict should be set aside; but that it was only when the judge himself who tried the case was not only not quite satisfied with the judgment, but when he and the court were satisfied that justice could not be done unless the matter were submitted to a new trial—in such cases only the court would interfere. He would now call the attention of their lordships to what were the two points in the present case upon which the rule was obtained. The one branched out into some four or five, to all of which he was afraid he should have to advert. Their lordships were well aware that this was an action brought upon a patent claiming a new discovery, or new invention, in the manufacture of gas. The invention consisted in the application of the hydrated oxide of iron to the purification of gas from sulphuretted hydrogen during the process of manufacture, and also in the renovation of this material, after being so employed, by exposure to the air. Upon the trial it was contended—and many points of law arose upon the objection—that a person of the name of Croll, by means of a patent and specification in 1840, and another person of the name of Laming, by means of a patent and specification in 1847, had anticipated the plaintiff, and consequently that his patent could not be sustained. Now, the question of law arising on a comparison of the specifications having undergone a great deal of argument and consideration, at the bar and on the bench, he believed he was right in stating that their lordships were agreed that there was nothing upon any of those earlier specifications which, as matters of law and upon the face of them, invalidated the patent of the plaintiff. But, then, with respect to one of these patents, a question arose to be submitted to the jury. In the case of Mr. Croll there was not only his patent of 1840, which was ten years before the publication of the plaintiff's invention, but, under that patent and with a view to the framing of his specification, Mr. Croll had experimented upon the purification of gas in many ways for many months. Those experiments failed, and he (Sir F. Kelly) would show their lordships that the great discovery of Mr. Hill's was unknown to Mr. Croll. He experimented in a great variety of ways, and dealt with a great variety of oxides, in various chemical conditions. He tried many other metals and oxides, and whenever he dealt with an oxide of iron at all, under such conditions as that the sulphuretted hydrogen in the gas could be brought into contact with it, no doubt the experiments appeared to be partially successful; but the result of the whole was that, after experimenting in these different ways, the matter was abandoned. The patent indeed was taken out, and it referred not merely to this improvement or supposed improvement in the manufacture of gas, but to a great variety of other purposes, many of them of some importance, as to which the patent was no doubt useful and successful, but with regard to this particular part it was entirely abandoned, Mr. Croll himself frankly admitting, as witness in this cause, that at the time of his patent, experiments, and specification, he did not know what hydrated oxide of iron was, or what was the effect upon this manufacture between hydrated and anhydrous oxide of iron. His patent, therefore, as to this particular point, was abandoned, never acted upon by himself or by anybody else; and, subsequently, in delivering a lecture, Mr. Croll expressly stated to the public, to whom he was supposed to have communicated the plaintiff's mode of purifying gas, that the only way of effecting the object was by the use of lime. He also stated as witness that, until after the publication of the plaintiff's specification, he was utterly unaware that this particular form or condition of the iron would produce the effect in question. Still, notwithstanding these facts, as there was a user, and as it appeared, undoubtedly, that after trying the black oxide of manganese and other metals in a great variety of forms, he did also try the oxide of iron, and as he (Mr. Croll) supposed, perhaps truly, the hydrated oxide, the learned judge thought that this raised a question for the jury. Accordingly, the point was left to them whether this was such a public use, within the meaning of the statute, as to deprive a subsequent patentee of the benefit of the invention. The jury, whose intelligence and attention to the subject entitled their opinion to weight, either in Westminster Hall or elsewhere, having decided this point in favour of the plaintiff, and having held that the

* See pp. 330 and 370 for the arguments on the first portion of the rule.

experiments of Mr. Croll did not amount to such a public use of this invention as to avoid the subsequent patent, their lordships were now called upon to set aside the verdict, and hold that these experiments did amount to such a publication as to come within the meaning of the statute. Before referring to Mr. Croll's evidence in detail, and before asserting what he believed to be undeniably the law upon the subject as laid down by the learned judge on the trial, and by other judges, especially by Lord Chief Justice Tindall, he ought just to remind the court of one or two considerations which must have had great weight with the jury, as bearing upon this question, and which he hoped would have the like effect with their lordships. It must be remembered that during the whole period of fifty years since the manufacture of gas had been carried on in this country for the benefit of the public, the only material used in its purification from that which it was indispensably necessary it should be purified—sulphuretted hydrogen—was lime. The effect of the use of that substance for the purpose upon the interests of the manufacturers and upon the health and comfort of all engaged in the manufacture, or who had the misfortune to dwell within a short distance of the works, was such, by reason of the nauseous and noxious substance of which it was productive, that it was quite impossible to believe if this discovery of Mr. Hills—which did away entirely with this nauseous and noxious substance, and relieved the manufacturers of gas, the people in their employ, and the inhabitants of the neighbourhood from all the sad consequences of the use of the material—that if this discovery had even for one day been known and understood by any one individual connected with the manufacture of gas, it would not have been instantly adopted and brought into public use, whether protected by patent or not. And when the jury, satisfied of that, found that until Mr. Hills' discovery, for which he took out a patent in 1849, and specified to the world in the month of May, 1850, no one manufacturer of gas in Britain had ever possessed himself of the discovery and brought it into practical use and effect, and that in as short a time afterwards as the litigation to which he was exposed would permit it was at once adopted to a great extent in the country, and he might say universally in the metropolis, being deemed one of the most important and valuable inventions of modern times—he submitted that these facts staring the jury in the face must have had a great effect upon their minds. For instance, when it was said that Mr. Croll was the discoverer of it in 1840, the jury would naturally ask themselves—"If so, how was it possible that until 1850, when Mr. Hills' specification was published, it was not adopted?"

Baron BRAMWELL: I think, Sir Fitzroy, there is a fallacy in what you are stating. The value of the patent of the plaintiff is that it is of a compound character, that of purification and renovation. The attack made upon you in respect to Croll was—it was said—not that Croll had shown previously the entire invention of the plaintiff, but the purification by hydrated oxide of iron. Then it was stated that that would be valueless unless you could renovate the material.

Sir F. KELLY reminded his lordship that Croll adopted a process of renovation, though not the same as the plaintiff's. This observation, however, would not apply to Laming, for he claimed to have discovered both processes, and actually to have communicated them to Hills. The facts to which he had referred were pressing upon the jury at the time they came to their decision, and he hoped they would have due weight with their lordships. He ventured to assert that unless it was the duty of a court of law to pick holes in a patent and suggest grounds by which a meritorious inventor might be deprived of the fruits of his skill and ability, it seemed to him that upon such evidence as that to which he was about to call attention, it was impossible the jury could have come to any other conclusion. He asserted, moreover, that it was quite inconsistent with the principles which governed this court in matters of this nature that that verdict should be disturbed. Now the evidence of Mr. Croll was, that in 1840 he used the process at the Brick Lane works, which was described in his specification, and he obtained the oxide of iron which he employed, by precipitating it from sulphate of iron by means of ammoniacal liquor or caustic lime. But it must be borne in mind that the very essence of Hills' invention was that he used the hydrated oxide of iron, and no other. Indeed, when, for the protection of his own patent, the plaintiff was obliged to proceed by *scire facias* against the adverse patent of Laming and Evans, and after there had been a great deal of litigation, he expressly declared that the anhydrous oxide he cared nothing at all about, and if they could purify gas with it they were welcome to do so. By the evidence on the trial, the hydrated oxide was admitted to be the property of Hills and of Hills alone. The chief persons who came forward against him—Mr. Evans and others—had taken licences from him for the use of hydrated oxide of iron; and in one action for infringement of his rights £800 was recovered by way of compromise. Mr. Croll told the court at the trial of this case that at the time his patent was taken out his attention had not been at all directed to the question of hydrated or anhydrous oxides; and when he was asked whether the object he had in view, as far as the oxides were concerned, was the removal of the sulphuretted hydrogen, he went into a long statement as to the effect of carbonate of manganese, fairly stating, however, that he did not know at the time the difference between hydrated and anhydrous. The great bulk of the experiments which he made from time to time were with the oxide of manganese, and so far was he from feeling that he was the inventor of the process now in question, that he actually took a licence from Hills for the use of hydrated oxide. In his evidence at the trial Mr. Croll said, in reference to the experiments which he made, that they were on a very small scale before the date of his patent, and that down to the time of his specification he had not mastered the distinction between hydrated and anhydrous oxide. "I did not know," he said, "what state it was in, but I found I obtained active purification at one time greater than at another, and for that reason I believed in some state of oxide which the metal was in, and therefore I specified 'oxides.'" Now, this was all he knew upon the subject, and yet this gentleman was supposed, ten years before the plaintiff's patent, to have given to the world the invention now in question. This was the patent and this the practice which was supposed to be such a communication to the world as to deprive the plaintiff of the fruits of his discovery. In reference to his own patent, Mr. Croll stated that, after it was obtained, he never made the material or sold it, as he did not consider it of value, though he granted licences for the use of it, and the parties to whom he did so might have used it. And when he was asked whether it was in the year 1849 or 1850 that he first acquired a knowledge of the distinction between hydrated and anhydrous oxides, he replied that he did not remember at what time it was. Now, upon this evidence the observation immediately arose—in this course of experiments which were, he (Sir F. Kelly) would not say wholly unsuccessful, because possibly Mr. Croll might at one time have used the hydrated oxide without knowing its importance——

Baron BRAMWELL: He certainly did, because he describes how he prepared it.

Sir F. KELLY: But without knowing it at the time.

The LORD CHIEF BARON: What difference would it make if he did not know its name?

Sir F. KELLY: It is not a question of name. He did not know that the substance was the hydrated oxide of iron.

The LORD CHIEF BARON: He neither knew its name nor its composition, but he knew that if he had that certain substance he could produce a certain effect with it, and no one else could take out a patent for that.

Sir F. KELLY said Mr. Croll did not know its effect. What he did was to try experiments during the six months between obtaining his patent and filing his specification, with perhaps not six, nor ten, nor sixty metals or modifications of metals, and all he knew was, that from time to time a greater or less effect was produced. In the course of using this large number of metals in various conditions, it was clear from his description of the process he must have used hydrated oxide. But he did not know that it would produce the effect of purifying gas from sulphuretted hydrogen; and, when he saw the beneficial effect produced, he did not know whether it was the hydrated oxide of iron or any other substance to which it was attributable.

Baron BRAMWELL: Having stated in his specification, "I use a substance which I prepare thus," and so having described hydrated oxide of iron, you will say that would be a previous communication. But your proposition is, he does not say on the face of his specification that he does use the hydrated oxide either by words or description. Then you go further and say that neither the obscure statement in the specification, nor the practice, nor the two conjoined, give such a clue to what he was really doing, that any one would at once adopt it.

Sir F. KELLY: And I say that that was a question for the jury. If the fact that in the specification, or if the fact that in the course of five or six months' experiments, the hydrated oxide of iron was used and did purify gas, be fatal to a subsequent patent, that is a matter of law; but it is not so. The fact that in the course of a long series of numerous experiments one out of a hundred substances has been used, which will produce the effect, and the producing of which effect is the subject of a subsequent patent, I say if that were to invalidate the subsequent patent, it would be a question of law; but your lordships have held that it does not. But the question is, whether the fact of his using the article in the way in which he used it was a public use within the statute of the subsequent discovery by Hills; and that is a question for the jury.

The LORD CHIEF BARON: You do not admit that it is in the specification?

Sir F. KELLY: I admit to this extent, that it is exactly as if he said, "I am now going to enumerate a thousand metals, any of which will purify gas;" and it turns out that in certain conditions one of the thousand will do so, though he does not know it at the time, and was wrong as to all the rest. Just as if he were to say, there are certain ingredients in nature which will absorb sulphuretted hydrogen, and will purify gas; that may be true, but if he does not tell the public what the ingredient is, and how it is to be applied, that is not such a communication to the public as would deprive any person subsequently patenting one of these ingredients of the benefit of the discovery. It would be an abuse of language to say that the former had thereby communicated to the world that which he did not know himself. If Croll were to bring an action against Hills for infringement of patent, on he ground that ten years before he (Croll) communicated to the world that hydrated oxide of iron would purify gas, he would have, according to the evidence given upon the trial in this case, to make the inconsistent statement that at the time of his patent he did not know that hydrated oxide would really produce any such result.

Baron BRAMWELL: With great submission he would say, "I must answer your question, 'Yes and No.' I did know that precipitated oxide would, for I used it; but if you had asked me whether it was properly called hydrated, I must answer I did not know."

Sir F. KELLY: If that were so, why did not he continue his experiments? If he knew that that which was the precipitated oxide would purify, why not continue it?

Baron BRAMWELL: He tells you that where you can use lime and get rid of the "blue billy," lime is the best. He said—"I only use the hydrated oxide of iron because they will not let me make use of the Thames to get rid of the refuse." Still I do not think that that removes you from your position. I understand your proposition to be this:—You say the court are supposed for this part of your argument to admit that the discovery is not announced in the specification in words. Then the defendant says—"No; but it is announced by implication in this way, that any competent chemist would know, when it is said the gas is to be purified by hydrated oxide of iron, that Croll must have meant the precipitated." To this you reply that the state of knowledge at the time would not lead him to use it, and that is a question for the jury.

Sir F. KELLY submitted that Croll merely knew this—not that hydrated oxide of iron would purify, but that in the course of his experiments he found a better result produced at one time than at another, and therefore he specified "oxides." And Croll himself, at a lecture which he gave some years afterwards, admitted this, for he said—"These obstacles would warrant the almost universal abandonment of dry-lime purifiers. Now, however, in connexion with this process of purifying gas from ammonia, the dry-lime purifier will, it is anticipated, become the only system used for the abstraction of the sulphuretted hydrogen." So that, four years subsequent to the date of his own patent, he had no notion that this secret was before the world. As this was a question for the jury, the point now was, not whether the jury might not have found otherwise, but whether the jury had found that these experiments—experiments he would not say wholly unsuccessful, but certainly not understood by the experimenter—were not a public use of the invention within the statute, not a communication to the world of how the world might purify gas, and had found it, too, with the aid of the fact that for ten years afterwards the thing was never attempted, their lordships were to say that the jury were wrong. He would now call the attention of the court to what fell from Lord Chief Justice Tindall in one of the leading cases, *Kenrick v. King* (Webster's *Patent Cases*), which was a patent for indiarubber web. The Lord Chief Justice said, with respect to what the question turned upon—"The main question is, whether this No. 3, which is the principal subject of the patent, was or was not in use in England at the time of granting these letters patent? Was it or was it not, in the language of the Act of Parliament, such a manufacture, which is a very wide and extended meaning? Was it or was it not such an invention at the time of making the letters patent as was current in use? If this No. 3 was, at the time of these letters patent being granted, in any degree in general use, if it was known to the world generally and practised openly"——

The LORD CHIEF BARON: Was there any prior patent in that case?

Sir F. KELLY: No, my lord.

The LORD CHIEF BARON: Then there was hardly anything which in

the present case applies. I take it to be quite clear that a patent cannot be taken out for that which has been stated in a former patent, though accompanied by no use whatever.

Sir F. KELLY: But that question I understand to be decided by your lordships already. I quite agree with what fell from the learned judge on the trial of this case, that the jury might, in considering the effect of the practice, take into account the former experiments and patent, as well as the user, and so far the two cases were different; but this was a case in which the question was left to the jury.

The LORD CHIEF BARON: It has become now the common-place of the patent law, and you want no authority to say that mere prior user, either in a closet or large manufactory, provided the knowledge does not travel beyond the manufactory, will not invalidate a subsequent patent. I think you misunderstood the effect of the intimation of the court, which I take to be this:—The judges cannot read the prior patent so as to say that the subject of the patent is in point of law void. That is all we said, but we may be in a condition to say the prior patent goes so very near the latter that we think it is a question fit to be considered.

Sir F. KELLY: The question is, whether that has not been considered—most deliberately and minutely considered?

The LORD CHIEF BARON: I own it does not appear to me that any dictum of any judge is required to throw light upon the law of prior use not invalidating a subsequent patent, if the use has been confined and limited.

Sir F. KELLY: I thought it was so, and therefore shall only trouble your lordships with a case or two, for we are now considering whether the verdict of the jury was wrong.

The LORD CHIEF BARON: No.

Sir F. KELLY: Oh yes, my lord; I am upon the question of the verdict being against the weight of evidence. Upon the charge of the learned judge, to which no exception is made—upon this question being left to the jury, whether the experiments as detailed by Croll, taken with or without reference to the patent which he had taken out and the specification which he had not written out, constitutes a prior publication.

The LORD CHIEF BARON: I think you may take it that apart from his specification it would not.

Sir F. KELLY said he was very glad to hear that remark, for he thought it put an end to the question. If Croll had specified something which in point of law did not of itself invalidate the subsequent patent, the question then was whether, taken together with those abortive experiments—the patent, specification, and experiments being all abandoned, and nothing done upon them from that time to the present—this was such a public use and communication of any portion of the invention of Mr. Hills? Upon that question the jury had found that it was not. He (Sir F. Kelly) was now contending that that verdict was perfectly correct, and he would call their lordships' attention to what in cases of this nature were the elements of the question which the jury had to consider, and what they ought to hold and what they ought not to hold to be a public communication of a secret. Lord Chief Justice Tindall said that if it was known at all to the world—published and publicly known—and practised openly, so that any other person might have the means of acquiring the knowledge of it as well as the person who obtained the patent—then the letters patent were void. On the other hand, if it were not known and used at the time in England, then, as far as this question is concerned, the letters patent will stand. It was a question for the jury to say whether, upon the evidence they had heard, they were satisfied that the invention was or was not in use and operation—public use and operation—at the time the letters patent were granted? It was obvious that there were certain limits to that question, and whether it were brought within the precise description he had given depended upon the facts which were submitted to the jury. A man might for his own satisfaction make experiments in his closet; but if, having made them, he did not communicate them to the world, but let them die and become forgotten, another person might take out a patent and protect himself in the privilege of it for fourteen years. And it would be no answer to say that another person had made some previous experiments upon the same subject. There might be many discoverers starting at the same time, but the first who came to the Crown was the man who had the right to clothe himself with the authority of the patent and enjoy the privilege which it secured.

The LORD CHIEF BARON: All the court is thoroughly impressed with the truth of what you state, without any authority whatever. The principle which those cases establish is a principle well understood by the whole court.

Sir F. KELLY said the principle here laid down was that a mere experiment not brought to completion, but beginning and ending in uncertainty, was not such a publication as contemplated by the statute. Now, what experiments could be more uncertain than those described by Croll, and which were afterwards abandoned by him without being brought to any successful result.

Mr. BOVILL said he must correct his learned friend as to their being abandoned.

Baron BRAMWELL: I think it is not correct.

The LORD CHIEF BARON: I wish Sir Fitzroy Kelly to understand that we are thoroughly impressed with that doctrine, and we do not want case after case. We fully and entirely acquiesce in it; it is now the common-place of the patent law, which everybody knows who pretends to know anything about it. The application of it to the present case is a different matter.

Sir F. KELLY said for this reason it was that he wished to call their lordships' attention to the cases. It was not disputed that this was a question which should have been left to the jury. It was left to them, and they found for the plaintiff, and their lordships were now asked to say that their decision was so wrong—so absolutely and palpably wrong—that it ought to be reversed.

The LORD CHIEF BARON: You will very much more advance my view of the immediate question before us if you will state upon this point what was the precise question left by the learned judge at the trial, and what was the precise issue and fact which you consider the jury to have found?

Sir F. KELLY said he would do so in the very language of Baron Bramwell, and proceeded to read portions of the summing up of the learned judge.

Baron BRAMWELL: I think you should read the next paragraph. "Now, with the knowledge that we now have, possibly if it stopped there, where I have read to you—this mode of purification—one would be inclined to say that it rather would indicate the use of either oxide, because we know now apparently that either the hydrated or the anhydrous would purify; but at the time when Mr. Croll invented it, and, indeed, at the time when the plaintiff specified, one may say it appears that the state of chemical opinion upon it was such that people would have assumed that it must have referred to hydrated oxide alone, because it was hydrated oxide alone which was at that time supposed to be capable of purification."

Sir F. KELLY said it would be singular indeed if this should upset the patent of Hills when the learned judge was obliged to call the attention of the jury to the state of science at the time in order that they might understand what it was that Croll meant by his specification, and whether it was substantial and identical with what Hills afterwards discovered. Croll himself being called, proved that if he meant that identical substance it was unknown to him, and therefore, however the judge and jury might interpret the language, the material was something which he did not know to be the same as that which Hills claimed. [The learned counsel proceeded to read further extracts from Baron Bramwell's summing up, but was interrupted by]——

The LORD CHIEF BARON, who said: You are not now meeting what I desire. I am quite sure that there is in your own mind an impression of what you consider the jury to have found, and I am asking for that, and not for you to read to me the short-hand writers' notes, which I can read for myself when I get home.

Sir F. KELLY: I thought your lordship asked me to read the summing up.

The LORD CHIEF BARON: No; I want you to state in your own language the proposition which you intend to enunciate. I do not ask you to read what passed at *nisi prius*, because the matter can hardly ever be there presented by the judge in the condensed form in which, as between the court and yourself, it may be presented.

Baron BRAMWELL: I think, Sir Fitzroy, you may consider that the jury answered in your favour the complex question, "Does his specification point out the use of hydrated alone, or of the hydrated and anhydrous, or does it point out the use of anhydrous only? Was his practice beyond an experiment in the sense in which I have described it to you?" A little further on I said to the jury, "I should say further that you are well entitled to consider both together, and to say whether together they form such a publication of the matter that it could be said—bearing in mind, of course, the explanation I have made to you—that Mr. Hills' invention, supposing him to have invented it, was not a novelty." The jury answered that the specification did not disclose it; the practice was nothing more than experimental, and the two combined did not reveal the secret.

Sir F. KELLY said he understood the jury to have found upon the whole of the evidence before them, and upon the charge of the learned judge, that Croll did not, either by his specification or by his experiments separately, nor by both those media put together, publish the invention for which Hills took out his patent. If he had done so by either, the patent of Hills was void; but the jury, upon a very deliberate consideration of the specification and Croll's own evidence, had come to the conclusion that he had not done so.

Baron BRAMWELL: There is a very strong piece of evidence in your favour which has not been mentioned. Laming, who is called for the defendants, professes himself to have discovered the use of hydrated oxide of iron some eight years after Croll specified. He was the defendants' own witness, and must be familiar with gas matters, having had his attention directed to improvements in it all his life.

Sir F. KELLY: It certainly is a very striking thing that Laming, possessing great practical knowledge of the subject, and himself the author of a patent which was said to have been eminently successful in Paris, should, knowing Croll's patent, not appear to have discovered from it anything like this invention of Hills'.

Baron BRAMWELL: He says he invented it himself.

Sir F. KELLY, referring to the Lord Chief Baron's remark, said he thought he was not wasting the time of the court in calling attention to what had been said by other judges on the question of the value of experiments as indicating a previous communication of an invention, and invalidating a subsequent patent. Were the public, he asked, for ever to be deprived of the benefit of such an invention as the present because some experimenter found out that some one of a hundred ingredients which he had tried would effect the desired object, though he did not know by means of which it was done? The steam-engine, the electric telegraph, the hot blast, or this method of purifying gas, by which the lives of many human beings might be saved and the comfort of thousands preserved—were the public to be deprived of all these things because of some experiments made years ago upon them, although the public were kept in entire ignorance upon the subject? The jury in the present case having found that neither Croll's patent nor his practice, taken separately or together, communicated the secret which Hills claimed as his discovery, would this court set aside their verdict? and if so, upon what grounds? He would venture to ask, further—How were the manufacturers of gas throughout Britain to possess themselves of this valuable process, when Croll, the only man who pretended to communicate it, did not himself know that he had discovered it? and why should the patent of Hills, by which this invention was claimed, be declared void, when the jury found that neither by Croll's specification nor his practice was there any previous publication? He knew not how, when a useless patent had been taken out, any inventor of a real secret, which was eminently successful and useful to the whole world, could ever secure to himself the benefit of his discovery, if the verdict upon this point were to be set aside. The only effect would be to send this case down to another five days' trial, and he could not help saying that that would be a great grievance. Unfortunately, however, the case did not rest here; for upon the question, not of the novelty, but upon whether Hills was or was not the inventor, a case was brought forward of a very extraordinary character. It was insisted, quite independently of the specification and the points of law, that Mr. Hills was not himself the inventor of this process of purifying gas by hydrated oxide of iron and then renovating the material by exposure to atmospheric air, but that it was communicated to him (this applied rather to the latter branch of the invention) before the date of his patent by Mr. Evans, who had himself been making experiments under Laming's patent and with Laming's assistance.

Baron BRAMWELL: Communicated as seen by him. He saw what Laming was doing.

Sir F. KELLY said the facts were shortly these:—Laming, who had given great attention to this subject, and had taken out a patent in 1847, was, in the summer or autumn of the following year, engaged with Mr. Evans, and afterwards with Mr. Thompson, in experimenting upon this mode of purification at the gas-works at Westminster, and the two-fold charge which was now the point in question was made in reference to the matter. It was said, first, that Evans, upon a particular occasion, in an interview between himself and the plaintiff, actually communicated these experiments and their result to Hills. Then it was said that Hills, having been upon the premises, must have seen the process going on, and must therefore, independently of the communication by Evans, have learnt the secret; that consequently he was not the inventor, but that he had been guilty of a great breach of faith in taking out a patent for that which was not his but

another person's improvement. Now, if there were any one human being who knew the absolute and positive certainty as to whether he was himself the inventor of this process, or whether before he took out his patent it was communicated by another man, or he had learned it from witnessing experiments at Laming's, it must be Mr. Hills himself. Although, as he should show, Evans might be confounding one interview with another, and one conversation with another, and so be innocent of perjury, he (Sir F. Kelly) did not hesitate to put it to the jury that Hills, a man fifty years of age, if he learned this process from Evans or by witnessing the experiments of Laming, must be, when he alleged upon his oath and in a detailed manner that it was the result of his own experiments, a perjured man. Evans swore that he communicated the secret to Hills in a conversation, though he could not give the precise time. Against this there was the positive oath of Hills that no such communication was made, and that he had no knowledge of any experiments of Laming's going on at the period referred to. But let them look at the surrounding circumstances. Hills stated that he experimented upon this process for many months in succession in 1848, a year before the nearest time given by Evans, and that as the result he discovered that atmospheric air would have the effect of carrying off the sulphur, and so renovate the material, fitting it for use over and over again. The corroborative evidence was this:—Hills said that he communicated to the Rev. Mr. Dale—a clergyman who took an interest in chemical matters—the completion of his discovery in the course of 1848, six months and more before Evans and Laming pretended that they had experimented upon the subject. Mr. Dale was called, and he corroborated the statement of Hills *in omnibus*, but most unfortunately upon this point, and this point alone, he had an imperfect memory of dates. He could not remember whether this communication was made to him in 1848 or not. It was very improbable, however, that it would be after receiving the communication alleged to have been made by Evans. But both Mr. Hills and Mr. Dale swore that the former made the communication of the completion of the discovery just before a hole was made in the wall between some gas-works and Mr. Hills' premises at Deptford. The question then was, when was that hole made? Mr. Dale could not recollect, nor was there any one in court who could positively swear to it, except a person of the name of Barnard, who happened to be there for some purpose or other. He was called, and from his evidence there could be no doubt entertained that Mr. Hills was perfectly right in saying he made the discovery in 1848. [The learned counsel read the evidence of Barnard.] In the cross-examination of this gentleman there was something said about the material employed by Hills, but he (Sir F. Kelly) did not understand that any doubt was raised as to whether the experiments to which Mr. Dale was a party were experiments in this renovating process.

Mr. Bovill: Not as to the experiments, but as to the date.

Baron Bramwell: Hills swears that the renovating process was discovered in 1848, and communicated to Dale. Dale says—"I know that he communicated the renovating process to me, but I cannot say whether it was in 1848 or 1849, though I am sure he was experimenting in 1848, and I know the renovating process was discovered at the time the pipe was put in." Then the date of the pipe was material, and Barnard was called, who says Hills was experimenting in 1848 with this material, and after that he put through the pipe. Then an attempt was made to see whether he could give any more definite date than "after that," but he could not; and when you read that these experiments were continued until the year 1853, it might be that the pipe was put on any time in 1849.

Sir F. Kelly: It would if that stood alone; but allow me to call attention to what I said: I asked, "Can you tell me as nearly as may be the dates—the periods when first any experiments were made with materials supplied by Mr. Hills?" and he answered, "I think it was the middle of the summer of 1848. I had a pipe connected to our mains for Mr. Hills taking his experimental apparatus to experiment on our works. I think it was, perhaps, August, 1848—it might be July.

Baron Bramwell: That must be the beginning of the experiments.

Sir F. Kelly: No; that is the putting on the pipe. I do not understand that any experiments were made with Barnard's works until this pipe was put on. The only thing in doubt is when the experiments were successful. Hills might have experimented on his own works before the pipe was put on.

Baron Bramwell read the short-hand writers' notes of his summing up of this part of the case, and his own notes of Barnard's evidence.

Sir F. Kelly said his lordship's notes omitted the question which he (Sir F. Kelly) put to the witness, and the reply which he had just read, which showed that the experiments were antecedent to the making of the pipe.

Baron Bramwell said he had a distinct recollection that it was assumed at the trial there was an ambiguity about Barnard's statement, and that the only thing he could say was, "it was after August or July, 1848."

Sir F. Kelly said there was no doubt some ambiguity; and all he would observe was, that though on this report there was nothing to contradict his lordship's notes, there was an omission in the latter which was quite consistent with the former.

After some further remarks on the point,

Baron Bramwell said: Do not suppose I am struggling to maintain the accuracy of my notes, although I should be sorry if they are wrong; but I have so distinct a recollection it was assumed by all parties that there was some difficulty in the evidence, and the short-hand writers' notes of my own summing up, which have not been impugned, lead me to have a very strong opinion upon it. [His lordship re-read Barnards' evidence.] It was sometime *after* the commencement of the experiments that the pipe was connected.

Sir F. Kelly said there was something intrinsic in Barnard's evidence to which he would just refer. It appeared that in his cross-examination he said, "I have no doubt it was sawdust mixed with some material that I supposed at the time was mixed with iron. That was in 1848 It was a glass purifier; I could almost tell it was sawdust—I have no doubt of it" Therefore he made out that these experiments were going on with sawdust and something mixed with iron, which could only relate to these experiments, and this was in 1848. Taking, then, the fair result of the evidence, though he admitted it was not so positive as one could wish, these experiments had become successful, they had been communicated to Dale, and this pipe was made in 1848.

Baron Bramwell: I am very much inclined to think that the true explanation of this is that there were two pipes. Barnard says, "He sent a small glass purifier and connected it with the pipe I had got ready for him, and passed the gas through it. Those experiments were continued a great number of times during 1848; after then I connected a pipe, and carried it on to his premises." That is another and different pipe.

Mr. Montague Chambers: You will find in Hills' evidence he describes first of all sending this glass purifier into the gas-works, and, finding that answer, he had a pipe communicating with his own premises.

Baron Bramwell: Then there were two pipes, and in that way you reconcile all the notes.

Sir F. Kelly said it must also be remembered that Hills and his brother had most distinctly sworn that it was in 1848, six months before it was said to have been communicated to him. But supposing there were no corroborative testimony to the positive oath of Hills on this point, yet with the further evidence that the experiments in 1848 were undoubtedly of this mixture of sawdust and iron, the jury must determine one way or the other; it was a question of accuracy, and pre-eminently one for them to determine. What ground was there, then, to set aside the verdict as against the weight of evidence, when there was nothing to corroborate Mr. Evans's statement, and much in the case, even as it now stood, to corroborate Hills'? But he would go a little further, and show that originally it was a mere mistake of Mr. Evans (though he was afraid it had been persisted in longer than he should have done), and that he had been confounding one interview which he had with the plaintiff with another, and also the communication which he made.

Baron Bramwell: Let me stop you upon that point. Undoubtedly Mr. Bovill, and those who are with him, will claim to address the court upon the point; but I shall as undoubtedly report that, without the least imputation upon the integrity of Mr. Evans, his evidence was quite demolished. He evidently remains under a great mistake.

Sir F. Kelly reminded his lordship that three or four years afterwards Evans appeared in connexion with this very dispute before the late Mr. Rotch, when he stated that he could not tell the exact day when he made the communication, but that it was on the day of the great thunder-storm in 1849. Hills, on the other hand, swore that he brought his experiments to a successful result, and communicated his discovery to Mr. Dale in 1848, but that it was not until the month of July, 1849, that he had an interview with Mr. Evans, who then told him, not about any renovating process which he had discovered, but that he and Mr. Laming were about to make some experiments upon the purification of gas. That was in July, 1849; and it could not be later, because on the 4th of August, four days before Laming and Evans commenced their experiments, the plaintiff went to Scotland, and did not return until the end of the month: after which he was at Evans's works only once, and then but for half an hour, in the month of September down to the end of the year, at which visit he had no communication with Evans. Now, it turned out that the day of the great thunder-storm in 1849 was the 26th of July, which was before the date of Evans and Laming's experiments.

Baron Bramwell: You may almost dispose of Mr. Evans by saying that the only way in which he could reconcile the matter was by saying he supposed there were two thunder-storms.

Sir F. Kelly said he should sit down and trouble their lordships no more, but that, ancillary to this communication from Evans to Hills, it was asserted that Hills was not the inventor, and that he must have seen something going on in the yard. Here again Hills swore positively that between the time when Evans and Laming's experiments commenced until the end of 1849 he was only once on the premises, and that then he saw nothing to lead him to know what was going on. In support of their statement also, that Hills was not the inventor, the defendants gave in evidence that when he was before the Attorney-General in relation to this patent, on the occasion of some opposition or threatened opposition, he was called upon, according to the practice of that day, to make out a deposit-note of the different matters proposed to be secured by his patent, and they said that from the contents of that paper it was clear he did not mean to claim this. The particular part of that paper—which he had to prepare in the Attorney-General's chambers, without any assistance—was this: "For absorbing sulphuretted hydrogen and other gases into porous bodies, and removing them again, either by heat or taking off the atmospheric pressure." That certainly was not a very critically accurate description of his invention, but what was the use sought to be made of it? Why, that he was not really the inventor of the process, and did not know of it at the time he thus described it.

Baron Bramwell: Or, as Mr. Bovill put it on the trial, did not intend to claim it.

Mr. Bovill: Or intended to disguise it.

Sir F. Kelly said, if he did not really know of it at the time, but invented it subsequently, that would be a defence to the action, because he would have taken out a patent for one thing and specified another; but as he (Sir F. Kelly) put it to the jury, he would put it now:—How was that consistent with the evidence to which Evans had pledged his oath, not that he did not know of this, but that he was not the inventor, because this very process had been discovered by Laming and himself, and had been communicated by him to Hills. That was their case. If Hills had known it he might have described it properly, and it could not be said he misdescribed the process because he did not know it or found it out afterwards. There was an end, therefore, of that point. But then Mr. Bovill said he did not mean to claim it.

Baron Bramwell: Let me tell you what I understand Mr. Bovill to say. He says:—"Hills had been experimenting upon some contrivance of sawdust and water for, as I understand it, mechanically freeing the gas from sulphuretted hydrogen by passing it through these materials. It would pass through it by removing the superincumbent pressure of the air, and he took out his patent for that. When he made out his note at the Attorney-General's he did not intend to filch Mr. Laming's specification; but afterwards a bad change came over his mind, he found out that his own invention was rubbish, and he claimed this as his own."

Sir F. Kelly: But what defence would that be to the action?

Baron Bramwell: He uses that as auxiliary, to establish the point that Laming was the inventor, and that Hills took it from him.

Mr. Bovill: And from Croll also.

Sir F. Kelly: Then what should induce him to take out a patent? He took out that patent in November, and it seems he remained honest down to that time, although he knew it? Why should he be dishonest in January or February, or when he specified, any more than in November, when he took out the patent? But again, is not this a question for the jury? Let us see what are the facts on the other side. Their case is this, that in 1849, in the course of the summer, Evans and Laming had communicated to Hills this discovery.

Baron Bramwell: I must undeceive you on this point. They not only rely upon the communication from Evans, but they rely upon the fact that Hills and his brother were present when the process was going on, they say it must have been obvious to every one who understood the matter that hydrated oxide of iron was being used.

Sir F. Kelly said he thought it was proved beyond all manner of doubt that so far from Hills, the plaintiff, having been there to see these experiments, he was only there once from July, when the experiments had not

begun, until the end of the year, and then only for half an hour, when he saw nothing. He swore also that his brother had never communicated it to him, and in that he was corroborated by his brother. But, supposing Evans to have succeeded in satisfying their lordships' minds that he was right, that there were two thunder-storms, and that he had made this communication on the day of some thunder-storm which nobody else had ever heard of, was it possible to believe that when Hills went to take out his patent in November following Laming, a man accustomed to take out patents, would not have opposed him before the Attorney-General or have taken some steps to defeat the patent? But these men, who were supposed to have communicated this valuable discovery, took no steps to oppose him on that occasion. In May, 1850, Hills specified under the patent, and published to the world this very invention as his own, and yet they never ventured to dispute his patent from that time to this. Was it to be supposed that if they were the authors of this valuable discovery they would have allowed Hills to take the benefit of it for years, and never seek to impeach his right? The thing was idle and absurd, and no jury in the world would believe that men would conduct themselves in that way if they felt they were really the meritorious authors of the invention. But the thing did not even rest there. They said that they were the inventors, and that Hills filched it from them. They allowed him to take a patent and did not oppose it; they allowed him to specify, and took no notice of it; they allowed him to carry the invention into practice and make large profits by it in many gas manufactories, and they took no steps to impeach or call in question his right, or even suggest that they were the authors of the discovery. On the other hand, Hills, having obtained his patent, found in the following year that Evans and Laming had taken out a patent for something which he said was embraced in his patent—viz., for this very hydrated oxide of iron. What did he do? First of all, he opposed them before the Attorney-General, and they were obliged to strike out that part of their specification which related to the hydrated oxide of iron. Instead, however, of acting upon what the Attorney-General compelled them to do, when they came to specify under their patent they ventured to put forward this claim, and actually specified the very invention of Hills. What did Hills then do? Did he witness their invasion of his rights, and lie still and permit them to proceed? As soon as might be after the patent was published to the world, he instituted proceedings by way of *scire facias*, and so directly impeached the validity of their patent, and sought to bring the question before a judge and jury. Evans and Laming then went before the then Attorney-General (Sir F. Thesiger), and so far from insisting upon it as their invention, they prayed to be allowed to strike out so much of their claim as related to the invention of Mr. Hills. Sir F. Thesiger objected to allow them to do so, for he thought it was a fraud upon Mr. Hills. The consequence was that Mr. Hills proceeded with his action, the defendants suffered judgment to go by default, and the patent which they took out was invalidated by those proceedings. And yet the court was now asked to set aside the verdict of a jury who believed that Hills was the real and true inventor of this process upon the evidence of those gentlemen, although from the beginning to the end of every proceeding the course of Mr. Hills had been honourable and straightforward in the extreme. But the case did not rest even here, because at a later period a deed was entered into between these parties and Mr. Hills, by which the use of hydrated oxide of iron was secured to him, he giving up all claim to anhydrous oxide, as he believed it would be entirely useless; and they consented to take licences under him for the use of the hydrated oxide. It was only now that the patent had got into general use in the metropolis, and the immense value and importance of the discovery was realized and brought into practical effect, that a number of the gas companies coalesced together, and brought forward the testimony of Laming, Croll, and Evans, to deprive the plaintiff of the benefit of his discovery. This was the case, and the question was whether their lordships would, after the matter had been deliberately submitted to a very intelligent and patient jury, feel that it was necessary to set their verdict aside, and perpetuate this terrible litigation between the parties by sending the case down for another trial. There was a document before the jury, to which he would invite the attention of the court, as bearing upon the question whether anything that had preceded the taking out of Hills' patent was more than experiment, either altogether unsuccessful or not understood, and which therefore could not be a communication to the world of his secret.

The LORD CHIEF BARON: You mean all the experiments by everybody?

Sir F. KELLY said the only cases which were given in evidence were those of Croll and Laming, but the document to which he referred really applied to them all. It was a publication by Evans of a report made by him to the directors of the Chartered Gas Company upon these very experiments which he and Laming had been making under Laming's specification, and which he said were with the same materials as Hills', and therefore vitiated his patent. That report was dated the 20th of January, 1850, two months after Hills' patent.

The LORD CHIEF BARON: Who put it in evidence?

Sir F. KELLY: The defendants.

The LORD CHIEF BARON: I do not see how it can answer your purpose; it was after your patent was out.

Sir F. KELLY said the question was whether, when Hills took out his patent in November, 1849, Evans and Laming between them had mastered this same invention, and were themselves the authors of it. This report, dated two months afterwards, conclusively proved that up to that time they were not the authors of any invention upon which they could venture to take out a patent, and that their experiments upon a large scale, instead of being practically useful, had wholly and totally failed. [The learned counsel read the report of Mr. Evans, commenting upon it as he proceeded.] He prayed their lordships to consider this document—it was not evidence given in a hurry, but a deliberate report made to the directors of the company, of which Evans was the servant, in relation to Laming's experiments—Laming and he being both well acquainted with the general state of the question before the world. They were acquainted with Croll's patent, and had had their own attention directed to modes of purifying gas—Laming had succeeded to some extent in Paris—and yet Evans was found deliberately reporting in January, 1850—"Here the matter rests; the material is still in the purifiers, and does its work very partially—in fact, it is now quite useless for the whole of the gas we make," &c. He (Sir F. Kelly) would now pass to the other points mentioned in the rule, and would scarcely do more than mention them, as he really felt that they answered themselves. The first was, "That the specification of the plaintiff is insufficient and bad, for not specifying which hydrated oxide of iron will answer the purpose, and for claiming all hydrated oxides of iron, though some will not purify gas." This was founded upon a mistaken view of the specification, which clearly pointed out that it was precipitated oxide of iron. But, had there been anything in it, it would have been a question for the jury whether it was the hydrated oxide that would purify. Then it was said, "That the mere application of hydrated oxide of iron to absorb sulphuretted hydrogen from gas was not the subject of a patent, its properties and effects with reference to sulphuretted hydrogen being previously well known." This was a common objection to patents, and he did not think it called for any remark. The next point was, "That the renovation of hydrated oxide of iron by exposure to the air being previously well known, its application to purifying gas was not the subject of a patent."

The LORD CHIEF BARON: That is, it is a practical application of a scientific fact well known; that is nothing.

Sir F. KELLY said the next point was, "That the specification of the plaintiff, as amended by the disclaimer, was not within the title of the patent as amended; that, having disclaimed that part of the title which referred to obtaining certain substances applicable to the purifying of gas, the plaintiff could not claim for the renovation of the purifying material as he had done." The patent now stood, "For an improved mode of manufacturing gas." Surely that was large enough to comprise the use of hydrated oxide for purifying gas from sulphuretted hydrogen in the second stage of the process—large enough also to comprise the renovation of the material which had effected that purification by exposure to atmospheric air. Both of these processes were in the middle of the general course of the manufacture of gas, both belonged to the manufacture, and both formed a part of the mode of manufacture—consequently they came clearly within the expressions employed, "an improved mode of manufacturing gas." The plaintiff had disclaimed a portion of the original title, but what remained was clearly a portion of the process, and so, as he (Sir F. Kelly) submitted, within the title of the patent.

Mr. MONTAGUE CHAMBERS said he would advert first of all to what were the points submitted to the jury, and how they answered them. The jury asked his lordship to put down in writing the questions which he had asked them, and his lordship said: "I have put down what I think will convey the questions which I put to you. Is the invention new—first, as a whole; secondly, in its first part; thirdly, in its second part? If not as to all or either—that is, if not as to the whole or to either of the parts—is that owing to what was done under either Croll's or Laming's specifications, or from what is there stated, or from both considerations combined? Secondly, is the plaintiff the inventor—first, of the whole; secondly, of the first part; and thirdly, of the second part?" His lordship also said: "I cannot ask you to tell me separately whether you find that Mr. Evans told Mr. Hills. All I can ask you to tell me is, whether the invention which he specifies here is an invention which he learned from them?" Sir F. Kelly had endeavoured to convince their lordships that, with regard to the communication made to Mr. Hills, in point of fact, they were out of court; and all, therefore, that he would add was, that so strong was the evidence on this point, that had the jury found a contrary verdict the court would say the verdict was so clearly against the evidence that they must send the case down for a fresh trial. The jury answered every question in favour of the plaintiff—that each part of the invention was new, that the whole was new—each part his invention, and the whole his invention, so that the question now was, whether there was anything in the evidence which could induce the court to say the verdict was unsatisfactory, and there must be a new trial in order to satisfy the consciences and minds of their lordships that the jury had done wrong in the first instance. It was a very formidable proposition which the other side had put forth, when they said the verdict was against the evidence. He asked the court to read the printed report of Mr. Evans, upon whose testimony the whole imputed deception of Mr. Hills rested; and, if there was not another piece of evidence in the case, he would say that it was most conclusive on the points at issue, because it gave the whole history of the experiments made by him, beginning with the 8th of August, 1849. He would hand up to their lordships Mr. Evans's report as it appeared in the JOURNAL OF GAS LIGHTING, and would ask whether, up to the time at which the report was written, there had been any success with those experiments. He was sure that the court sitting as a jury would answer that there had not. After the experiments had been unsuccessfully made on a large scale, they sent for Mr. Thompson, the chemist, who had assisted Mr. Laming before, and who attributed the failure to cold weather. They tried again, and Mr. Evans, who was bound to report justly and truly to the company, said, in point of fact, the experiments had been unsuccessful. This fact completely crushed and destroyed any suspicion of discovery by Laming or Evans. He did not wish to charge Mr. Evans with intentional misrepresentation, for it appeared that, at the time experiments were going on at these gas-works for the purpose of purifying gas from ammonia, which required a totally different process from the sulphuretted hydrogen. Hills said he understood when he was there that Laming was trying experiments for that purpose, and all that he saw was perfectly consistent with that fact, for it was not pretended that before the 8th of August, 1849, there were any experiments made by Laming or Evans to purify from sulphuretted hydrogen by the aid of metals. The other point put forward was with regard to Croll's patent; and the more their lordships read that patent the more would they be convinced that at all events with regard to one part of the plaintiff's claim—the renovation—it was clearly very different from that. And as to the use of the hydrated oxide of iron, the evidence was conclusive that he did not employ it in such a way as to nullify a subsequent patent. Connected as he was with three or four gas companies, he knew the importance—the infinite value—of any process by which he would be enabled to dispense with the use of lime in purifying, either in a wet or dry state; and his statement on this point was most candid and fair. But what did he know about this method? It appeared that in 1840 for many months he experimented with different metals, and, amongst others, he tried what he called "the oxides of iron." But he said he did not know the difference between the hydrated and the anhydrous oxides. How much gas he purified by them did not appear; but this, upon his own testimony, did appear, that the experiments were not successful, for he did not use these oxides to any extent; and moreover, four years afterwards, in a lecture addressed to persons interested in gas matters, he spoke of the inconvenience of the lime purification, but stated distinctly that hitherto nothing in substitution of it had been then discovered. The Lord Chief Baron had correctly stated the rule in reference to such a subject as this—viz., that if a man in his study makes experiments, whether successful or not, there was no publication to the world, and therefore nothing to vitiate a subsequent patent. The only witness called with reference to Croll's patent was Croll himself, whose testimony being what he (Mr. Chambers) had stated, it was supposed on the other side that his specification and user were to vitiate the patent of Hills in 1849, which had led to so great a revolution in gas purification. Mr. Croll's knowledge with regard to gas manufacture was exceedingly important; and if his experiments had been successful, he would have made his fortune by introducing this method into the various companies with which he was connected. And yet the thing slumbered on until 1849, and it was not until Mr. Hills began to reap the produce of his industry and skill that the defendants raked up this specification of Croll's in order, if possible, to avoid it. He submitted that neither Croll's

specification nor his practice were such as to convey to the ablest chemists a knowledge of what was imparted to them by Hills' discovery. It need not be pressed upon the court that this was as great a case with regard to Hills as the discovery many years ago which came under the Arkwright patents; because, as the use of gas had extended all over the world, the use of this process became of the utmost value and importance, and it was not the less important that the gentleman who had discovered and patented it should have the full benefit of his patent. He believed that, so far from Croll considering himself the inventor, he gave evidence that after Hills' patent came out he paid for a licence to use it.

Mr. WEBSTER: Mr. Croll never paid anything.

Mr. CHAMBERS said at all events he took out a licence, and why should he do so if he knew himself to be the inventor; and if he did not know it himself, how could it be said that he had published it to the world? With regard to the other point of the case, whether the title of the plaintiff's patent covered too much or too little, there had already been a great deal of elaborate inquiry, and he believed there was nothing for the other side to rest upon since the court had looked into the evidence and said it was not against the plaintiff on that point. He, however, pressed upon their lordships with great humility, yet with great anxiety, how essential it was, after great pains had been taken to get up evidence, and the judge had taken the greatest possible pains to submit every point to the jury, that the case should not go down to a fresh trial.

The LORD CHIEF BARON: No doubt, Mr. Chambers, a new trial is a great evil. Year by year we gain experience of that. One consequence of it is, that you never get the fair, clear, impartial view you get at first. You get the entanglement of contradictory statements between the evidence at one trial and another, and the influence of party and partisanship, which, no doubt, is acting in the first trial, and which becomes ten times more in the second;—the trial is longer, and I think, less satisfactory. You may say a new trial is a great misfortune; the only thing is, it is a greater misfortune if it is manifest there has been a clear miscarriage in the first trial, and there is not some means of correcting it. In the simplest case, in the shortest case, in the least expensive case, it is a misfortune to have a new trial, *à fortiori;* it is a greater misfortune in a case which has lasted so long and created such great expense. I hesitate not to say that I think the court ought not to grant a new trial unless it sees it to be an imperative duty, particularly with respect to the finding of a jury.

Baron BRAMWELL: Let me quote to you what Lord Kingsdown says, as reported in the last number of the *Jurist:*—"In my opinion, to advise the reversal of a judgment, it was not sufficient to doubt whether it was right, they must feel a reasonable assurance that it was wrong."

Mr. CHAMBERS: I should like to have that inscribed in one of the books of practice in large letters.

The LORD CHIEF BARON: We ought to have it inscribed in the court. You may depend upon it that the prevailing feeling in this court is, that a new trial is a misfortune.

Mr. GROVE followed on the same side. He said he would venture to put in stronger terms than Lord Kingsdown had done the question of affirming or reversing the verdict pronounced in a court of competent jurisdiction. He apprehended that their lordships must be satisfied, not that the judgment of the court was different from that of the jury, but that the trial by jury miscarried; that the jury had not before them the means, or did not exercise their proper function, in dealing with contradictory questions of fact. The argument was stronger as against the court in dealing with questions of fact than in reference to questions of law; and the court must be satisfied, not that the opinion of the jury *may* be wrong, but that something has taken place by which the jury did not exercise their true constitutional power. In the present case, what were the facts upon which the jury had to decide, and what were those which balanced their judgment in favour of the plaintiff? It was said that Croll's specification and experiments separately or jointly anticipated this patent of the plaintiff. The jury had this question before them, that the attention of gas companies had been directed to the importance of avoiding the purification of gas by lime, and yet that nine years elapsed from the time of Croll's specification being brought into use, while Croll had himself confessed the insufficiency of his experiments, and said that, however injurious the use of lime might be, it was the only process which up to 1844 could be practised. This was a pretty strong argument upon the fact of whether Croll's specification or practice disclosed to the public the use of hydrated oxide of iron.

Baron BRAMWELL: I do not wish to interrupt you, but I think there is a fallacy here. Croll said it had not failed, but was too expensive to use. Perhaps that was in reference to the renovating process.

Mr. GROVE: But that was known by Croll's patent. Croll himself purports to renovate it in his patent, not, certainly, by exposure to air, but by heat.

Baron BRAMWELL: I just want to make a remark, not possibly but what you may make it, but rather for the sake of the opposite party. It is a very strong point that no one of their witnesses says that Croll's specification discloses this matter. Take Dr. Odling, who is asked, "With the knowledge that was common in 1840, would you or any one else infer from the mention of 'oxides of iron' that it was the hydrated or the anhydrous, or both?" His reply was, "I conclude that the term 'oxides' would include both anhydrous and hydrated; were I to try experiments, I should certainly select the hydrated, from my knowledge that it was most likely to succeed." All he says, therefore, is, he should have "inferred," not that he should have known for a certainty, that it was meant; but he should have thought it more likely to succeed. Surely that was a question for the jury?

Mr. GROVE said they had dealt with the question of the specification as a question of law, but there was an alternative upon the specification, which was also a question for the jury. The witnesses for the plaintiff contended that the specification of Croll did indicate anhydrous oxide, for though in the first instance it might be hydrated, yet his system of renovation, by which it was brought to a red heat, would make it anhydrous; and it was more probable that a person reading the specification would try that than the other. Therefore, if there was any ambiguity upon the specification, the evidence for the plaintiff was very strong in favour of this supposition. And so much did the counsel for the defendants believe this, that they called witnesses to prove that anhydrous oxide would succeed. Now, it was quite immaterial to the plaintiff if anhydrous would do; he did not claim it; it was no part of his invention, and the defendants might employ it if they chose, and produce the best effect they could. There were two points upon which alone, as far as he could see, Croll's specification could be submitted to the jury, to ascertain whether it would convey that conclusion. Reading the whole specification, there was strong ground for believing that he used the anhydrous; but the question was, whether a man who said "oxides" will do (including, as the term did, a large number of oxides, native as well as artificial), he himself not knowing which will do, but having found by a certain experiment that some state of oxide would succeed, could communicate to the public the requisite information, it never having been shown that any one acted upon it, or that any human being was ever thereby led to the use of hydrated oxide? Could such a man be taken to have disclosed the invention of hydrated oxide, that being one of several matters which would fall under the term of "oxides," and of which a class—not a small number, but a large mass of native oxides—would not succeed? On the contrary, a person reading that specification might be led into a long series of experiments, lasting for years, to ascertain which would, assuming that one would, succeed. Then, take the experiments by themselves. As far as he had gathered from reading the evidence, it was not proved that Croll made those experiments before a single member of the public, that he showed them to a single person, or, if it were assumed in favour of the defendants, that he was assisted by some one in his operations, that person had never even been named. Even admitting that he was, the probability was in favour of that person not knowing what he was working upon. Therefore, the experiments *per se* could not be said to be a disclosure. It had been said that he purified 20,000 feet of gas per day by this means, and that appeared a large quantity; but it was, after all, nothing, for as he (Mr. Grove) believed, 7,000,000 cubic feet per day was the working of a gas-work. Nor did Mr. Croll say that he purified that 20,000 feet with the oxide of iron wholly, or whether partly with the many other things that he tried. But he said that the gas so purified was mixed with gas made in the ordinary way. Then how was any member of the public to know of the invention? Were the consumers to know it? The gas was the same. Mr. Croll did not, neither did Mr. Hills, patent the result, but the process of purification. How, then, could this be said to be such a disclosure as would put the public in possession of the invention, and invalidate letters patent for a specific ingredient taken out nine years afterwards? Then, taking the specification and the experiments together, could the fact of publication be made out? He could conceive of a case in which, taken together, the specification and the practice might aid each other. It might be that a man might say in his specification, although it would be bad there, "experiments are going on every day, from ten to twelve o'clock, which the public may see." That would be an intimation to the public which, accepting the invitation, might be put in possession of the requisite information. Take another case, in which the specification was too obscure to indicate what the experiments were. The public reading the specification would be uncertain as to the result; but as soon as the experiments were seen, they, taken together with what knowledge was gathered from the specification, would instruct them. But, after all, it required, to his mind, a degree of *finesse* to see how experiments and specification would do what the specification alone would not do. The only case which occurred to him was one in which the specification, by being, so to speak, a treatise, might give a character and extent to the experiments which would be otherwise bald, and more in the shape of a recipe themselves. Even so he did not think it would be the specification, but the experiments which would disclose the secret. But, to put out of the question any hypothetical case, did they do so here? In the first place, there was not the slightest communication shown. No human being besides Croll ever saw them. It was not as though some witness had come forward and said, "I could not make out what oxide was to be used; but I went and saw Mr. Croll's experiments, and then I knew it was hydrated." Indeed, there was a presumption of secresy, because the experiments were made for the purpose of the specification, and no publicity was proved by the defendants. If, after having taken out his own patent, he did not know his own invention, he would not be the first inventor. What then, it might be asked, was the object of the six months? It was not to make the invention, but to perfect it.

The LORD CHIEF BARON: To get it into its most complete form. Justice Bayley said on one occasion it would vitiate a patent, if a man did not put in the last improvement which he had discovered after the date of the patent. If he made an important further improvement, I do not see how there is anything to prevent his putting it in. No doubt the object of the six months is to enable him to present it in the most perfect form, and not to hurry him in giving to the public the invention in a crude state.

Mr. GROVE said: If Croll, during the six months, had discovered that hydrated oxide of iron would purify from sulphuretted hydrogen, he might have improved his process, but he had no right to take out a patent for that which was the subject of future experiments.

The LORD CHIEF BARON said he thought it might be laid down as a general rule, that if a man took out a patent for something, but spread his net so wide as to catch whatever he could, having no specific object in his mind, and many of the subjects in his wide spread net never having been the subject of experiment at all, but merely inserted on the possibility that they might answer; and if nothing was done under that patent for some years, and some one else made a discovery and took out a patent for one of those articles, which turned out to be useful, the mere mention of it in the first specification would not make the second patent invalid, provided the facts were as stated. But that was a question for the jury.

Mr. GROVE said he would assume a still stronger case against himself—that Croll had found out that hydrated oxide would do, but did not tell the public so in the sense which the law called publication. But in this case he had not discovered it. He had tried many things, but he did not trace the non-success in one case to the use of manganese or to the non-use of oxide of iron. And yet it was to be said that this was the person who, in 1840, disclosed to the world that for all practical purposes hydrated oxide of iron would absorb sulphuretted hydrogen from coal gas. He quite agreed that a man was not obliged to know chemical terms nor to give the *rationale* of his experiments. If he said, "Take so much iron rust, put it into your tank, and that will purify your gas," that would be a communication; but the knowledge must be certain, and a man must not say, "Take twenty things, and one will do; I do not tell you which." In the present case the public, by reading in the specification that "oxides of iron" would purify gas, might by making experiments come to the discovery that it was the hydrated oxide which would do it, but——

Baron BRAMWELL: May you not feel relieved by the fact that no one of their witnesses says, "He should read the specification and know, as a scientific man, that hydrated oxide of iron was meant."

Mr. GROVE said chemists knew that hydrated oxide would absorb pure hydrogen and be better than anhydrous, but it did not in the slightest degree follow that it would be useful in reference to the compound sulphuretted hydrogen, which, for the purposes of manufacture, was as different as possible. It was alleged by the defendants that it was known by chemists that it would absorb pure hydrogen, but there was not a tittle of evidence to show that it was known it would absorb it from gas, which, in addition to hydrogen (not pure hydrogen, but carburetted hydrogen), contained coal tar, cyanogen, and ammonia, and many other things. If the mere fact of such knowledge as was possessed were sufficient to vitiate this patent, it

would suffice to knock up every patent from the beginning, the merit of most of which being that generally known principles had been applied to produce practical results. The only other evidence to which he would address himself on the subject of previous publication was in relation to Laming's patent, and here there was the same difficulty about joining the two things. Here the conduct of the parties became a most material point for the consideration of the jury. Was it not a pregnant fact that the parties interested in asserting the priority of their patent did not assert it, but knocked under in every instance to the man who they said filched their discovery; shortly after this alleged robbery opposed their claim, and had it struck out at the instance of the Attorney-General; and subsequently, when he proceeded against them by *scire facias*, obtained judgment against them by default? Laming, the man who in the year 1859 asserted that Hills had taken out his invention in 1848, allows Hills to ride triumphant without remonstrance, except by trying with Evans to introduce his discovery into a subequent patent. But the question occurred, if Laming had, as he said, included this invention in his first patent, why did he and Evans want it in their second?

Baron BRAMWELL: I understand Sir F. Kelly did not address himself to that, but I suppose they will say it was anticipated by Laming's specification.

Mr. GROVE said the court had held that it was not so in point of law. In fact Laming, a practical chemist, who had been engaged all his life in this branch of manufacture, so far from thinking that it was in his previous patent, put it into a second, for which he was opposed by Hills, and had his claim struck out by the Attorney-General.

Mr. WEBSTER: That was the renovation, not the hydrated oxide.

Mr. GROVE said this fact and the subsequent one—that on *scire facias* judgment was suffered to go by default—threw, as he thought, a strong light upon the conduct of the parties. Did they stand in the same position of credibility as Hills, who, having stated himself to be the inventor, never failed to meet his opponents on all occasions and assert his rights? But then came a still more pregnant matter, a formal deed—not a mere memorandum or letter, but a deed obviously drawn up by the legal advisers of both sides—by which the parties interchanged cross licences, Laming giving Hills permission to use anhydrous oxide, and Hills giving Laming licence to use the very material which Laming not only said was his invention, but which Hills filched from him and Evans. Not only was this formal licence given, but Hills afterwards brought his action for royalties, and recovered £800.

Baron WATSON: The action was stopped.

Baron BRAMWELL: I think there was a little fallacy here. Hills has got his patent out, and specifies for this particular invention. Then when Laming comes, the Attorney-General says, "You are too late," a caveat being entered by Hills. They say—"It is very hard, for we are the inventors." "That may be so," said the Attorney-General, "but you should have been here before." It is clear to me that Laming could not take out a patent. He might in revenge have got a *scire facias*, and if successful got rid of Hills' patent, but the effect would have been to make public property of the invention, and neither would have got any benefit out of it.

Mr. GROVE: Hills' specification is dated after Laming's?

Baron BRAMWELL: After his specification?

Mr. GROVE: No, after his patent.

Baron BRAMWELL: Still I understand Sir John Romilly said—"You are too late. Hills has got a patent which comprehends this very thing; he has specified for it, and therefore you cannot have it."

Mr. WEBSTER: The practice was this:—Hills opposed Laming's patent, and the Attorney-General said—"You are too late. I cannot grant a patent unless you arrange."

Sir F. KELLY: Then why did not Laming oppose?

Baron BRAMWELL: I do think there is a fallacy in this. How could Laming oppose his taking out a patent in November, because he did not know that he was going to specify his invention.

Mr. DENMAN: Hills' deposit-paper did not tell the Attorney-General or Laming what the patent was.

Mr. GROVE: But Laming, according to the statement of my learned friend, was going to claim it wrongfully, because he had invented and patented it before, or a portion of it.

Baron BRAMWELL: He was going to claim the renovation also.

Mr. GROVE said the point he wished to call attention to was this, that this controversy took place three years after Laming said he had anticipated Hills in the discovery, and yet no steps had been taken to assert his right. Assuming that he did not know what was in Hills' deposit-paper, when it came to the *scire facias* he must have known, for Laming had then re-inserted what had been struck out. None of these matters were arguments of law, but simply questions as to the general conduct of the parties which might be called in aid, and which would always weigh with a jury in estimating the credibility and accuracy of witnesses. Then what was the alleged prior publication with reference to Laming? He thought the court would be clearly of opinion that his specification was no disclosure for this reason, that the only part of it upon which his learned friend could rely was that part which related to the mixing of chloride of calcium with muriate of iron, which was expressly disclaimed by Hills. This fact threw much light upon the previous experiments of Evans and Laming. Evans admitted that his experiments succeeded sometimes more than at others, and at last he gave them up. Why did they fail? Some gentleman whom he consulted said it was the cold weather, the thermometer being at 20°. The truth was it failed because he used hydrated oxide mixed with chloride of calcium, which the plaintiff said was not his invention. If that was not the cause of failure, why did they not continue to use it? They did not need the plaintiff's licence to do so. The reason of the less failure at times was, that the chloride of calcium may have drained off so as to leave the substance less deliquescent and slimy—the deliquescent and slimy character of the mixture being the difficulty which Hills in his invention entirely got rid of. The process of Laming was an imperfect one, and the thing specified by him primarily was not hydrated oxide but chloride of calcium, which, on the testimony of the chemical witnesses, was useful for removing the ammonia, to which purification the attention of the public on reading the specification would be directed. They would learn from it that the chloride of calcium might be made by a certain process, in preparing which certain metallic oxides were formed, which need not be got rid of because they were useful. Did that indicate that the thing which he said "need not be removed," was the efficient ingredient in the preparation? Were the jury wrong because they found it was not the thing indicated as the efficient agent, when not one person was called to say I got at hydrated oxide of iron by reading Laming's specification? If Laming's patent did not convey the knowledge to the public, did his experiments? The very experiments which Laming made then he could make now, for Hills could not prevent him. The very process which Evans said was filched from him, Hills said, "You may use still if you like, and purify all the gas in London with it." It had been said, that Hills saw those experiments. Admitted that he did, could the mixture of chloride of calcium indicate to him that hydrated oxide of iron was the efficient ingredient, always remembering that that which Laming had patented was the chloride of calcium? Then as to the renovation, it was said that he saw the material lying in the yard; but could he from that circumstance discover the process? Hydrated oxide of iron lying in the air would be of a reddish colour, but there was nothing in that to indicate that it had undergone a change by the exposure. Unless Hills had gone further and seen in detail every experiment which was made, and known that the oxide was exposed to the atmosphere in a black state for the purpose of being renovated, it was impossible for him to have drawn the conclusion that it had been used for the absorption of sulphuretted hydrogen. And the court had before them the positive contradiction of Hills. The defendants only said he *might* have seen it, and were the jury to believe that the possibility of his seeing some experiments with chloride of calcium a short time before he took out his patent led to the discovery that hydrated oxide of iron would purify and might be renovated for future use. The evidence was all on one side. If Hills had learned the discovery by communication from Evans, or had filched it by observing his experiments, would he have ventured to put Mr. Dale into the witness-box, who could have disproved his own statement? There was no imputation upon Mr. Dale; nobody pretended that he did not speak the exact truth; but if Mr. Hills were the party which his learned friend represented, he had called Dale, an unquestionably incorruptible witness, into the box, for the purpose of risking his own reputation upon what he must know to be false. There was no escape from that, and yet he was called at that perilous risk. Was not this a very strong case for the jury, especially when there was no reasonable requirement to impute perjury to either side? Mr. Evans would, no doubt, continue to his dying day to believe that he did make this communication to Hills. Hills admitted that he did make a communication, but said that it was in reference to experiments about to be made for removing the ammonia. Then came the excessive difficulty in which Evans was placed.

Baron BRAMWELL: It is clear that Evans's memory is wrong somewhere.

Mr. GROVE submitted that upon this point the verdict of the jury was incontestably right, and proceeded to refer at length to Laming's experiments.

Baron BRAMWELL: Will you let me tell you what presses upon my mind? I do not know whether you have read my summing up; if so, you have probably discovered what I am about to say. You perceive in the month of August or September, 1849, the plaintiff was engaged in making experiments in these gas-works with a water-scrubber, which really was a contrivance, as I understand it, to see whether he could purify gas by passing it through sawdust; and it was supposed that some of the sulphur would stick by the way, and so it would operate as a purifier. Then it was proposed to relieve the material so used by removing the air from the top of the vessel. In the paper which he delivered in to the Attorney-General no doubt he describes such an invention as I have been mentioning—that is, he speaks of purifying gas by passing it through a porous substance, and by removing the pressure of the air. He now says that that paper referred to the present invention, and it is true that the present invention involves the use of a porous substance. But it is not its porosity which gives it its cleansing power. It is true also that he contemplates removing the superincumbent air, but it is not that which gives it its renovating power. Its renovating power is acquired by exposure to the air. It struck me at the trial, and it strikes me now, that that paper was a very inadequate description of that which he now claims, but a very accurate description of that upon which he was then engaged. It struck me as a strong point for the jury, that he took out his patent in 1849 for the thing he was experimenting upon, and not the thing which he now claims. I laid it before the jury, but they did not take the same view.

Mr. GROVE: It certainly did not strike my mind in the way your lordship now puts it, or I should have been better prepared to meet it.

Baron BRAMWELL: I rather mention it now because it is important, and it is upon my mind. Do not suppose I cling to the opinion with any tenacity.

Mr. GROVE continued: The water-scrubber used at the works was for the ammonia, and had nothing to do with the sulphuretted hydrogen; and no air was used in any way. What did the plaintiff say in this very branch of his deposit-paper: "For absorbing sulphuretted hydrogen and other gases into porous bodies, and removing them again either by heat or taking off the atmospheric pressure."

Baron BRAMWELL: In dealing with ammonia heat is not required to remove it. The plaintiff expressly states "sulphuretted hydrogen," and therefore it is consistent with possibility that he saw Laming's experiments, but then he must have seen them before this deposit-paper. What Mr. Bovill says is, that when he deposited that paper he did not intend to do what he afterwards did.

Mr. GROVE: But when he deposited this paper he did not know.

Baron BRAMWELL: One of the witnesses said that there would be more or less of purification from sulphuretted hydrogen by passing the gas through a water-scrubber.

Mr. GROVE: No doubt it would be so, but that would not explain this.

The LORD CHIEF BARON: As water percolating through gravel is gradually cleansed of its impurities, so it is very likely that gas passing through sawdust or anything of that sort would lose some of its sulphur.

Mr. GROVE: It would lose many of those impurities which are soluble, but not the insoluble ones, like sulphuretted hydrogen. Would any one who had been experimenting, as Mr. Hills had, with a water-scrubber, have put at the head of his invention, "for absorbing sulphuretted hydrogen?"

Baron BRAMWELL: I did not say so.

Mr. GROVE: I understood your lordship that taking the deposit-paper *per se*, it is more consistent with the water-scrubber experiments than with what Mr. Hills specifies. I venture to submit that this is not so, for the commencing words of the deposit-paper are, "for absorbing sulphuretted hydrogen."

Baron BRAMWELL: Will you think of that meanwhile? I shall be glad to have my opinion set right on these points. It struck me that Laming's specification, I do not mean to say is identical, so as to direct a nonsuit, but it is very much like. He says—"I use chloride of calcium, which I use in conjunction with the oxide." It will be said that the plaintiff's specification is the use of the oxide, not indeed with chloride of calcium, but with the sulphate of iron, and it will be urged by Mr. Bovill that the only difference is, that one puts the chloride forward and the other the oxide; one says I will use lime and the other sulphate; and that the one inevitably suggests the other as matter of fact for the jury.

The further hearing of Mr. Grove's argument was then adjourned till the following day.

TUESDAY, NOV. 22.

Mr. GROVE resumed his address this morning, and said he would first allude to the point mentioned by Baron Bramwell yesterday, as to the apparent resemblance between head No. 5 of the deposit-paper and the experiments of Mr. Hills at the Westminster Gas-Works upon the water-scrubber. He ventured to think that when the court came to look at the evidence, that apparent resemblance would be easily explained. Mr. Hills had a previous patent, which was put in at the trial of 1848, and that patent particularly specified a water-scrubber, or a means of getting rid of ammonia by passing it through water mixed with sawdust or brushwood, furze or matting. [The portion of the plaintiff's patent relating to this point was read.] This branch of the patent of 1848 was confined to the absorption of ammoniacal vapours; and for a very good reason, since ammonia was a gas very soluble in water—so soluble that if a jar full of the gas was placed over water, the water would jump up into it as into a vacuum; whereas sulphuretted hydrogen was but sparingly soluble in water, only about 5 per cent. of it being absorbed. The plaintiff used water or saline ammoniacal solutions, because (he presumed) they were the common product of the gas, and would be ready at hand for absorbing ammonia. It was upon this that Mr. Hills was working at the Westminster Gas-Works, and not upon the abstraction of the sulphuretted hydrogen. This was clear enough from his own evidence, both in his examination-in-chief and his cross-examination. He distinctly stated that the experiments had relation simply to the taking away of ammonia. He was asked by Mr. Bovill—"Did you either try any experiments there, or ask any permission to try experiments, to take away the sulphuretted hydrogen?" and the reply was, "That I do not remember." "When you were there, were you aware that Mr. Laming was conducting experiments for the purpose of getting rid of the sulphuretted hydrogen?" "No, I was not." At that part of the trial, and indeed throughout the case, as far as he was aware, that point was never made at all; and the object of the questions was not to connect the experiments with the deposit-paper, but to fix a time when he was experimenting at Westminster.

Baron BRAMWELL: I think you are wrong there. When Sir Fitzroy Kelly read the deposit-paper he thought for the moment that it was not the one relating to this patent, and Mr. Bovill triumphed, I thought, in consequence.

Mr. GROVE said he could not discover that Sir F. Kelly adverted to the point at all in his reply to the jury. Mr. Bovill mentioned it in summing up for the defendants, but there was no evidence to be found in reference to the point in question.

Baron BRAMWELL: I have a most lively recollection of some reference being made to it in the plaintiff's examination, and Mr. Bovill was rather triumphant at the time.

Mr. GROVE said he had been unable to discover any such reference, and it appeared to him perfectly plain, looking at the evidence and at the previous patent, that, whether he took the invention from Laming and Evans or not (which was foreign to the present subject), Mr. Hills was experimenting upon the water-scrubber, the only object of which was to get rid of the ammonia. In the previous patent, he patented a particular mode of water-scrubbing, and in his patent of 1849 he claimed a water-scrubber for the same purpose.

Baron BRAMWELL: I am afraid this point is not quite apprehended by you. Mr. Bovill's argument is this:—"Your paper is not an apt mode of describing the invention of the specification, and I call upon the jury to infer from that, that when you deposited that paper you had not in your mind that invention; but what you really had in your mind when you deposited that paper was that matter which you have been experimenting upon—the scrubber. I contend that, because the paper indicates much more strongly such an invention as you were experimenting upon in September at the gas company's than such an invention as you say you ascertained before."

Mr. GROVE said he admitted that throughout the case Mr. Bovill contended that the passage in the deposit-paper did not fit the alleged discovery; but it was not until the close of the case that the other point was made, that the paper did fit what Mr. Hills was performing at the Westminster Gas-Works. But, however that might be, he could satisfy the court not only that it did refer, but must refer, to the process for getting rid of ammonia, and could not refer to the other process. The experiments referred to ammonia, and the deposit-paper to sulphuretted hydrogen.

Baron BRAMWELL: Is not that conceded?

Mr. GROVE: Then *cadet quæstio*, and I need not argue the matter further.

Baron BRAMWELL: I mean, it is conceded that he was experimenting to purify gas of all impurities by means of a water-scrubber.

Mr. GROVE: A water-scrubber would not do except for ammonia. It might answer partially, absorbing a small quantity, but not beneficially. As a practical process, the water-scrubber was totally inapplicable for sulphuretted hydrogen. In the patent of 1849 nearly the same terms were used as in the previous patent; and a special claim was made quite distinct from the claim for hydrated oxide. But it might be said that Mr. Hills had put in the part in question as a sort of blind; but the deposit-paper contained an express heading referring to that part of the invention:—"No. 4. Arrangements of pipes for distributing liquids in gas purifiers." The object of this improved machine was a better distribution of the water. There was no chemical point, no new compound in it; it was only a mechanical mode of better distributing the water in the water-scrubber, of which he patented one form in 1848, and another form in 1849. This cumulative evidence was conclusive. First, Mr. Hills said, "I was experimenting upon the means of getting rid of ammonia by a water-scrubber." He had a patent at that time getting rid of the ammonia; he was looking to improvements in that as in other things; in his deposit-paper he claimed for "arrangements of pipes for distributing liquids in gas purifiers;" and in his patent there was an express head for this very thing, nearly the same words being used. That being the case, there being a clause in the deposit-note which would fit the point in question, he would ask, did the other clause fit it? Did No. 5 apply to the scrubber? "For absorbing sulphuretted hydrogen and other gases, &c." The water-scrubber, as he had already said, would be useless for sulphuretted hydrogen. "And removing them again, either by heat, or taking off atmospheric pressure." That obviously would not apply. Heat would not apply to the ammoniacal process. If heat were applied, it would drive the ammonia back again. It was a condensing, not a heating process.

Baron BRAMWELL: Suppose he had a notion that sulphuretted hydrogen would be absorbed by this means?

Mr. GROVE: He was too good a chemist to have such a notion. He had been working all his life upon sulphuretted hydrogen, and he must have known the difference of solubility; but irrespectively of that, he would ask whether they were to suppose possibilities as against the verdict of a jury? The facts he had mentioned seemed to him all but irresistible in showing that the invention did not apply to the scrubber. If so, then it must have applied to something else that was in Mr. Hills' mind. Did it apply to the present invention? He did not wish to underrate the argument on the other side. It was said, if it did apply, as the purification was chemical, he would not have used the term "porous bodies," for that would apply to sawdust or any other material, and "porous bodies" would only apply to physical absorption. Throughout the final specification Mr. Hills used the term "porous material" for hydrated oxide. That, it might be said, was a cheat; but it was difficult to suppose so, as the present contest could not then have been dreamed of; and besides, on that supposition it must be believed that Mr. Hills, among other things, thought that at some future time this use of the word "porous" would be brought against him, and he therefore purposely inserted it in his specification. If the specification was innocently written, of which there could not be a doubt, the use of the term "porous" coincided with the deposit-paper. It appeared to be a general term used for chemical materials, and it was so employed in the specification of Laming and Evans.

Mr. DENMAN objected to any reference to the patent of Messrs. Laming and Evans, on the ground of its not having been in evidence.

Mr. GROVE said he was not referring to it to prove the validity or invalidity of the patent, but to show the use of the word "porous" in the sense he had contended for.

Baron BRAMWELL: It is hardly worth discussing.

Mr. GROVE said he only wished to show the general use of the term "porous;" and the expression, "for absorbing sulphuretted hydrogen," significantly marked the object of the porous material, because porous material *simpliciter* could not beneficially absorb sulphuretted hydrogen; the proof of which was, that these materials first absorbed ammonia; and if they absorbed sulphuretted hydrogen as well, no subsequent purification would be required—the dry lime and the wet lime purifying would be wholly unnecessary. He took it, therefore, as clearly established that the deposit-paper, in saying "for absorbing sulphuretted hydrogen into porous material," must mean some porous material which would absorb sulphuretted hydrogen.

Baron BRAMWELL: There is another observation in your favour. This head of claim may be a general head comprehending both the scrubber and the hydrated oxide of iron.

Mr. GROVE thought it was clear that No. 4 applied particularly to the water-scrubber, the essence of which was not chemical, but mechanical.

The LORD CHIEF BARON here intimated that if the whole day should be consumed by the plaintiff's arguments it would be impossible to finish the case this term.

Mr. GROVE said he was anxious to curtail his remarks as much as possible, and he was now only addressing himself to a point which one of their lordships had mentioned.

Baron BRAMWELL: What I suggested was this. The words used are: "For absorbing the sulphuretted hydrogen and other gases into porous bodies." As I understand, in the purification by hydrated oxide of iron, other gases are detained by the simple effect of wet acids. This, then, appears to be a point in your favour; it does therefore purify partly by the porosity of the body. Then he uses a comprehensive term. Had he said, "My claim is for absorbing sulphuretted hydrogen by passing it through hydrated oxide of iron," he would not have told the whole truth. Had he said, "For absorbing sulphuretted hydrogen and other gases by passing it through hydrated oxide of iron," he would have expressed himself inaccurately, because the other gases would not have been absorbed into the iron; therefore he uses the term "porous body."

Mr. GROVE: The other part was still more applicable. He removed the gases by heat and by taking off atmospheric pressure, the mode of doing which was described. Here again No. 5 in the deposit-note fitted the specification. Taking these circumstances into consideration, and remembering how the deposit-paper was written, while the Attorney-General was waiting, could it be said that the jury was wrong in finding that Mr. Hills had possession of the invention? It might be said that it came into his head afterwards to filch it from Laming's; but he did not think the jury could be asked to find against the positive testimony of a respectable man corroborated in many important particulars. Then there was another point to which his attention had been directed by the bench—the question of the sulphate of lime as an analogue of chloride of calcium. In the first place he submitted that they were not analogous. One was deliquescent, and the other was not; one impeded the transit of heat, and the other did not. The strong proof of it was that the defendants did not like their own process, and did not use the chloride of calcium which they had freely at their command, so that there must have been something better in the plaintiff's material. But supposing them to be equivalents, in the common sense of the term, Mr. Hills would still have a perfect right to them. Mr. Laming's invention was for the use of chloride of calcium for getting rid of ammonia; he said, in fact, "In making the chloride of calcium, you will have a deposit of oxide, but you need not get rid of it, for it is useful." He did not consider that it was a purifier, but he said, "You need not trouble to get rid of it." Mr. Hills' invention, on the contrary, was for hydrated oxide; and if Mr. Laming's patent had not gone before, he would have said, "You need not get rid of any of the ingredients; they are not as good as pure hydrated oxide, but practically they may answer." But Mr. Laming had happened to have a recipe in which he had said, "You need not get rid of this thing," and Mr. Hills disclaimed it. He maintained, therefore, that Mr. Hills was entitled to all but the specific recipe of Mr. Laming. If Mr. Laming's had been a special invention of a combination of chloride of calcium with something else, the chloride of calcium being itself inefficient, that would cover any similar combination; but as his invention was chloride of calcium and the hydrated oxide, a mere by-product, Mr. Hills, who found out that the hydrated oxide was highly useful for another purpose—namely, for the sulphuretted hydrogen—might say, "I not only claim hydrated oxide pure, but with all those ingredients with which it may be made in manufacture that are not prejudicial, except the particular one named by Mr. Laming."

Baron BRAMWELL: It struck me that, assuming the plaintiff had said, "You might make your hydrated oxide with muriate of iron," it would have come to this. Laming would have said, "I use A; I prepare it so that it is produced mixed with B; but I do not get rid of B, for B is a good thing. My patent is for A." Then the plaintiff would have said, "I use B; I produce it mixed with A; I do not get rid of A, because A is a good thing." That would be very like the same thing.

Mr. GROVE: No doubt it would; but the case, he ventured to think, was different. Supposing the material to be actually the same, then it would be a mere question in the mind of the inventor, which was beneficial? This, however, was a different thing. Mr. Laming said—"I invent the application of chloride of calcium. If I could get chloride of calcium cheaply alone, I should use that; but it happens that in one manufacture of chloride of calcium you have something else mixed; you need not get rid of that." That was no invention of the product—the invention is still chloride of calcium. But he admitted that as he had mentioned the product, he might

claim that product, and prevent any other person using it; but if in that product there was something else which Mr. Laming did not see, the benefit of which he did not use for the purposes for which it was specially applicable, and somebody else made that discovery, then, although he could not claim the particular recipe of Mr. Laming, he might claim every other recipe which worked with his patent. Supposing Mr. Laming claimed A, and said—"B happens to be mixed with it, but you need not get rid of it;" Mr. Hills claimed B, and said—"I cannot have it mixed with A, but you had better use B alone. It sometimes, however, happens to be mixed with C and D, and I won't have my patent infringed by its being used with those." That seemed to be a reasonable interpretation. Suppose, for instance, a person discovered that naphtha introduced into gas greatly improved its strength and the body of flame, but he found out that people, without knowing anything about the peculiarity of naphtha, had been making gas from wood fires and other things in which a little naphtha was used, he might then say—"I cannot prevent your using what you have been using before, and making gas with wood fires, but I claim the invention of the application of naphtha *simpliciter*, and also with other ingredients with which it may be combined." If the contrary were the case, every patent would be destroyed, because at some period of the world's history men have used the particular thing invented as an accidental by-product in some operation not having the same object as the patentee. Or take the case of a metallurgic patent, in which a man said—"I take borax, common salt, sal ammoniac, and two or three other things, mix them together in equal proportions, and put them into a flux." A man afterwards discovered that borax had a particular benefit in metallurgic operations, and was he to be prohibited from patenting it because some man had used a compound in which he mentioned borax with many other things without knowing anything of its particular virtue? It would go to the root of many a patent if the accidental use of a by-product were to prevent a man patenting that product for another purpose and in a beneficial way. He (Mr. Grove) ventured then to submit, first, that the sulphate of lime was practically and essentially different from the chloride of calcium; and, secondly, that if it were not, the invention was different, for the reasons he had stated. He should now briefly refer to the points of law reserved at the trial. He did not know to what extent his learned friend would rely upon them, but it would be necessary shortly to state the plaintiff's view respecting them. The first and second referred to Mr. Laming's specification; the third point was, that the plaintiff's specification was bad for not specifying which hydrated oxide of iron would answer the purpose, or for claiming all hydrated oxides of iron, though some would not purify gas. It was admitted on all hands that there were certain native hydrated oxides which would not purify gas, and the question upon the specification was whether, when Mr. Hills used the term "hydrated or precipitated," he meant to use the words "or precipitated" as explanatory of "hydrated," or whether he meant to claim the whole range of hydrated oxides. He ventured to think that the specification would satisfy the court that by "hydrated" the plaintiff meant "precipitated."

Baron BRAMWELL: Hydrated, otherwise precipitated. If their argument is right, he ought to have said, "hydrated *and* precipitated."

Mr. GROVE: There was one part of the specification which was conclusive on the point—a part which had been disclaimed, but which still might be referred to as showing the sense which was attributed to a particular word. It stated—"My mode of obtaining certain substances applicable in purifying gas consists of a method of making the precipitated oxides, &c." Here he used the term "precipitated" alone. The specification then went on to say—"To prepare hydrated or precipitated oxides and sub-sulphates, I take the precipitated sulphurets of iron obtained in any convenient way;" so that he evidently used the term "hydrated or precipitated" as synonymous with "precipitated" alone. The distinction to a chemist was quite clear. Hydrated or precipitated,—that was, hydrated oxides by precipitation. The next point was that of previous knowledge, which was a form of objection to every patent. It was known, no doubt, that hydrated oxides would absorb sulphuretted hydrogen when it was pure, but there was not a scintilla of evidence at the trial that it was known that hydrated oxides would abstract sulphuretted hydrogen from coal gas; indeed, the evidence was distinctly contrary. Still less was it known that these oxides would absorb sulphuretted hydrogen with sufficient celerity without injuring any other ingredients. If the previous knowledge in this case that sulphuretted hydrogen, when pure, could be absorbed by hydrated oxides, was fatal to this patent, then the steam-engine of Bolton and Watts and every other invention might be upset, because the chemical or physical principles upon which they were founded were previously known. The patent could not be obtained for the discovery of physical principles; the only thing for which a patent could be granted was an application which involved previous knowledge for a particular manufacture. It might be that the inventor made the discovery as well as invented the application, but in ninety-nine cases out of a hundred the inventor only invented a new application upon knowledge of principles previously acquired by the world. The next point was that the renovation of hydrated oxide of iron by exposure to the air was previously well known, nor was its application subject to a patent. That was a similar objection, to which the same argument applied. Although it might be known to a very limited extent that sulphuret of iron, when exposed to the air, would deposit sulphur and be in part decomposed, yet there was no evidence to show that it was known as applied to the manufacture of gas—that it could be applied so as to make the material useful again. The next point was that the specification of the plaintiff, as amended by the disclaimer, was not within the title of the patent as amended. It appeared to be doubtful whether the rule was really granted on that point at all. He did not know that he understood the objection, but he supposed it to be the same which was taken at a previous trial, and which after examination was found not to hold good. The title of the invention was—"An improved mode of compressing peat and making fuel for gas, and of manufacturing gas, and of obtaining certain substances applicable to purifying the same." It was contended that the portion of the title which included this invention was the last portion, and that, as that had been disclaimed, the invention fell with it. But it would be seen, on looking carefully at the specification, that the invention did not fall under that branch, but under the second branch, "An improved mode of manufacturing gas." In each step of the specification the title was followed, and he felt sure that the court would be satisfied that the branch of the specification which had been disclaimed did not apply to the use of the material in question, but to the particular mode of making them from the sulphurets. There might be other objections to the title, but, as he thought they could hardly be relied upon, he did not think it necessary to detain the court by any arguments upon them.

Mr. HINDMARCH, who followed upon the same side, said that the first thing which struck him as being of very great importance, and upon which he would offer a few words, was that part of the case which related to the prior user of it, as alleged by Mr. Croll in the publication of his specifications. He wished to remind their lordships that what the evidence proved Mr. Croll to have done was this—that he performed experiments with the view to prepare his specifications. He said he did prepare them—he did perform them. He performed them at intervals with oxide of iron and several other things between the date of his patent and his specification. He went further, and said that he obtained various results. Sometimes he had a good purification, and sometimes he had not. There the effect was uncertainty. He said he was ignorant of the precise chemical nature of the material which he operated on when he was using iron, but that was the effect of it; and what did it all result in? It resulted in the specification, and he (the learned counsel) submitted to their lordships that the only publication which took place was the specification itself. He said that was the result. The only effect which might be said to result from Croll's specification was that he gave to the world the fact that oxides of iron as a class might be used in the purification of gas. In considering whether that were enough to defeat the patent, it was necessary to look at not only what Croll did, but at the uncertain nature of his results. Seeing his want of knowledge, and how he applied it—seeing also that the very process he would use in order to enable him again to use the material would make the material not hydrated by anhydrous, his claim was clearly out of the question. It seemed to him (the learned counsel) that the evidence as to that was really all one way; but, even if it were not, the preponderance was so great that it was impossible for their lordships to say that the case was not one on which the jury had fairly exercised their discretion. Neither what Mr. Croll did, nor what he published in the shape of specifications, was enough to defeat Mr. Hills' patent on the ground of want of novelty With regard to Mr. Laming, he would remind their lordships that, even supposing that gentleman gave to the world the idea that hydrated oxide really would purify gas in conjunction with the hydrated nature of the oxide, a meaning was imparted, having reference to it. Their lordships would bear in mind that a very good patent might be had for leaving out a part of the combination. That had been ruled over and over again. [Counsel cited a case.] Now, supposing Mr. Laming's specification had gone the extent to which it was suggested by the other side, he submitted it was not at all sufficient to induce the jury fairly to come to the conclusion that Mr. Hills' patent was not valid. It had been said that there had been a user of something by Mr. Laming. This was, perhaps, one of the most important features of the case—important not merely with regard to the question of novelty or want of novelty, but also with regard to the question whether the plaintiff was or was not the inventor. A good deal had been said about the water-scrubber, and he certainly ventured to say—and he might answer for all his friends—that they never supposed this would be said only on the part of the defendants. It had been argued that this water-scrubber was going to take out the sulphuretted hydrogen, because everybody possessing the slightest scintilla of chemical knowledge knew that water would take up sulphuretted hydrogen. For himself, he could only say he never had the most remote idea that any such application was to be made of such a fact as that. They knew that the water-scrubber was a thing which had been connected with a former patent; experiments had been performed with it, not with a view to the obtaining of any future patent, further than that water was to be conducted into the scrubber by a particular mode. That was all that was contemplated, and their lordships would bear in mind that with almost every patent it was necessary to have recourse to experiment as to the best mode of removing the ammonia from gas. This was of very great importance—almost as much, in fact, as getting rid of the sulphuretted hydrogen. It appeared to Mr. Hills that the application of a current of water was best adapted to absorb the ammonia that was in gas, and to purify it from that material. It certainly was the impression which they all had. It might have been that there was something else on his friend's mind, but he certainly did not indicate it in the course of his cross-examination of their witnesses. It was said that there was a user at the gas-works of that material. Here he would remark that they were in the first instance, and until the defendant had given his evidence; they were, in fact, utterly unable to see what was the precise nature of the material which was said to be used at the gas-works, and which was described in those reports. All they knew was that it might be said that hydrated oxides alone, and not Laming's mixture, had been used, and therefore that Mr. Hills had seen it at the gas-works; but their lordships would remember that it afterwards came out clearly, and was distinctly admitted on all hands, and was borne out most clearly and conclusively by the report which had been handed up to their lordships yesterday—it was perfectly clear that Mr. Hills had not seen it. The only thing which he could have seen would be, what? Why, the very thing described in Laming's printed report. There was nothing, therefore, that suggested anything to his mind. There was nothing new—there was nothing at all which could make him cease to be the inventor. Besides, what could he see? Why, the chloride of calcium mixed with oxide of lime. He knew that well before, so that it could be no suggestion to him. What was the effect of the thing itself, apart from its taking away Mr. Hills' claim to be the inventor? It could not be said to be the use of hydrated oxide alone. It was perfectly clear that the thing was not successful; and why? He begged their lordships to look to this point, because it was extremely important. When the cold weather came on, and the solid chloride of lime got to such a temperature that it was crystallized, it would make this mass, otherwise very porous, cease to be very porous, and so deprive it of those particles which would purify. That was certainly a very strong corroboration of their case. They said that the material of Mr. Laming was so inferior in the results given, for reasons which he need not trouble their lordships by reciting. The porosity of the material employed was of the very utmost importance.

Baron BRAMWELL: You need not labour to show that without porosity it would be ineffectual.

Mr. HINDMARCH said he would take it for granted that the porosity of the material was a most important element in considering the nature of the material which was to be used. Their lordships would see that not only did Mr. Hills use the term "porous material," but it was again used in Laming and Evans's deposit-paper, and again in their specification, and therefore it seemed to him that sort of term naturally occurring to the minds of parties of this class endeavouring to get a patent for any particular invention or improvement. He maintained, therefore, that these experiments of Mr. Laming did nothing towards showing either that Mr. Hills was not the inventor, or that the thing was not a novelty. He contended that the experiments of Mr. Laming really did nothing towards showing that Mr. Hills was not the inventor of this process, and that the evidence on behalf of the plaintiff was not set aside by any testimony on behalf of the defendants. What did these latter do in April, 1850? Six months after the date of Hills' patent they went before the authorities, and made a solemn declaration that they had an invention which was substantially the same as that claimed by Mr. Hills previously. But it did not stop there, for in 1852

Mr. Hills obtained a *scire facias* against Laming and Evans to repeal their patent, the specifications of which, as they bore upon this case, had been brought before the learned judge at the trial. In consequence of this *scire facias*, Mr. Laming entered into a solemn deed with Hills and his partners, by which he acknowledged then and there plaintiff's title to the hydrated oxide; while Mr. Hills, on the other hand, admitted Mr. Laming's claim to the anhydrous oxides. These were the very terms of the deed. The date of Mr. Hills' patent was November, 1849, and of the specifications, May, 1850. Laming and Evans's patent dated from April, 1850; and therefore, so far as regarded their publication—taking that alone—Hills' specifications could not possibly destroy Laming and Evans's patent on the ground of previous publication. Therefore, if Laming and Evans had, as they said, the real right to the hydrated oxide of iron, they might have proceeded to repeal Mr. Hills' patent at the moment it was gone into. They were in a position, if they pleased to do so, to strengthen their rights in the most effective way possible, as they might by a *scire facias* have repealed Mr. Hills' patent. He maintained, therefore, that all these circumstances given in evidence on the trial on behalf of the plaintiff, were far more than enough to rebut and destroy everything which could be presumed from the very slender case set up on the other side. It was quite clear that the hydrated oxide was far superior to the anhydrous, or this case would never have been brought to trial. If Laming and Evans considered their process to be as efficacious as Hills', why not have been contented with it? It was evident by their conduct that, so far from being contented with the anhydrous oxide, they were convinced that the hydrated oxide was the most important discovery in relation to the purifying of gas. His learned friend (Mr. Grove) had called their lordships' attention to certain objections to the title of the patent. Their lordships would remember that Mr. Hills had disclaimed portions of the title, and his learned friend, Mr. Bovill, had argued from that that his claim to the renovating process was entirely out of the question. It must, however, be remembered that the title was subsequently applied to a different part of the invention, as it appeared in the specifications now before the court.

Mr. POLLOCK followed on the same side, and cited several cases against the rule.

The LORD CHIEF BARON said he would certainly express himself with as much strength as possible that a new trial was a misfortune which, he thought, could only be justified with a view of preventing a greater. It was only where the case was so clear, that not to grant a new trial would be a greater misfortune than granting one, that the latter course should be pursued.

Mr. BOVILL then proceeded to address the court in support of the rule. He said he would first draw their lordships' attention to the effect of the evidence so far as Hills was concerned. His case was, that he had effected this grand discovery in the purification of gas by means of hydrated oxide of iron, and the means for the renovation of the materials used in that process by August, 1848. He (Mr. Bovill) would accept that date, and treat the case on the assumption that such was the truth. Their lordships were then to suppose that Mr. Hills' experiments in the purification of gas were in the years 1847 and 1848, before August, and that by the last-mentioned time he had completed the whole of his discoveries for which he now claimed that particular patent. It was right that he (the learned counsel) should call the attention of the court to the fact that after August, 1848—namely, on the 19th of October in the same year—Mr. Hills took out a patent; and their lordships would remember that at the time when that patent was taken out the system prevailed—a system which was very well understood by the law officers of the Crown—that persons who were in the habit of taking out patents should keep what was called open patents. Well, in November, 1848, Hills, according to his own account, had made a complete discovery of this most important invention. In October, 1848, he took out a patent for improvements in treating certain salts or vapours, and for improvements in gas. The specifications were supplied six months afterwards, and included a vast variety of matters which referred to the purification of coal gas and the renovation of the material. [Counsel read portions of the specifications.] There was not a single syllable in that patent or in those specifications respecting the particular process which he now claimed as his own, though he had been, according to his own showing, experimenting upon the subject, and though the title of this patent was sufficiently open for him to have introduced into the specification the important discovery which he said he had made in 1848. That was the first remarkable fact to which he would direct their lordships' attention. Their lordships were asked to suppose that Hills had completed his discovery by August, 1848. There, however, was the patent taken out in November, 1848, and the specifications deposited in April, 1849, and yet not a single syllable on the subject. In November, 1849, the plaintiff took out another patent for an improved mode of compressing peat for making fuel for gas, and for obtaining certain substances applicable to the purification of the same; but, according to the ordinary use of language, not a word was said in it which indicated that he was taking out a patent for the purification of gas or for the revivification or renovation of the materials that were used by the process now claimed by the plaintiff as his own.

The LORD CHIEF BARON: This is the patent in question. Is there any Act of Parliament with reference to the title of patents?

Mr. BOVILL: There is now, my lord.

Mr. CHAMBERS: There was not at that time.

Mr. BOVILL called their lordships' attention to the title of the second patent, which was of so extraordinary and vague a character. [Counsel proceeded to read the title of the patent as supplied to the then Attorney-General.] The plaintiff said he had written this in haste, but the different heads of the title were described in very clear and distinct language. The only one of the whole six heads that could by any strain of language apply to this case was the fifth; but he would venture to say that there was not one of their lordships who, looking carefully at the paragraph in question, with their previous knowledge of the question, would say that it could possibly apply to that which the plaintiff now claimed. He now claimed that he had found out a most valuable method of purifying gas from sulphuretted hydrogen and ammonia, and of renovating the material used by exposure to the air. Now, there was nothing of that sort in the title to the patent. The fifth paragraph indicated a process for absorbing sulphuretted hydrogen and other gases into porous bodies, &c That was not his discovery. He (the learned counsel) saw no part of the great discovery which the plaintiff said he made before August, 1848, set forth in this patent. The next point in the process was a remarkable one—namely, removing the gases again by heat, &c, or taking off the atmospheric pressure. Here the plaintiff did not describe in any way the process which he now claimed. He (the learned counsel) defied any body to take the words of the specification, and by any construction of the English language to make out of them any description of the purifying process by hydrated oxide, or of renovating the purifying material after it had been used. The whole fact was this, that the plaintiff had been experimenting with sawdust and with a scrubber, and had discovered that gases, after being taken up into porous substances, could be got out again. This was the true explanation of his discoveries. Not only were the words of the title totally inapplicable to the present invention, but they were applicable to the very thing which he *was* doing at that time, engaged as he was in experiments with sawdust and other porous materials. They were met here by this most astounding fact—if fact it was—that this most valuable invention was discovered by the plaintiff, and completely discovered, in August, 1848; that he took out a patent in November, 1848, filed the specifications in April of the following year, and in neither of these patents made any mention of his discovery; and that the title of the later patent of 1849 was no more applicable to the discovery than the other documents; that there was no mention of it in the specifications of that patent, and nothing whatever to show that he was taking out a patent for the invention stated on the paper. The first thing which could be laid hold of as having any relationship to the present discovery was when the plaintiff came to specify under the patent of November, 1849, and then there came out a statement in the clearest terms of a process of purifying the gas by hydrated oxide of iron and the restoration of the material by exposure to the atmosphere. Then for the first time was the thing definitely mentioned, and then the plaintiff distinctly claimed to be the inventor. He (the learned counsel) submitted that such a case as that gave rise naturally to very grave suspicions against Mr. Hills, who, he contended, had not only the benefit of previous published knowledge upon the subject, but had actually seen the material itself coming out of the gas-works and exposed to the air. He admitted that if the case rested on the evidence as to the thunder-storm and as to the date of the conversation with Mr. Evans, the verdict of the jury ought not to be disturbed; and he would not now trouble their lordships with any observations on that part of the case, except to say that there was very cogent evidence on the side of the defendants that Hills had actually seen the thing done. If Mr. Hills, without actually seeing the process at Brick Lane, knew that Mr. Croll had taken out a patent and had used the process, and if he knew what Mr. Laming had published on the subject, it was almost impossible for him to form any specification which should escape either Croll's or Laming's specifications. The only explanation he (counsel) could make of the circumstance was, that afterwards, when he had taken out his patent, he thought that, by using equivalent terms without employing the same language, he could so disguise the matter that persons would believe that by a change of terms a different process was referred to. What was Mr. Croll's case on that point? He was the superintendent of the Brick Lane Gas-Works at that time—a man who had considerable ability in the manufacture of gas, though without any high scientific knowledge of chemistry. He found out, however, by experiments, beyond all doubt, that if he used the oxide of iron—the hydrated oxide or the anhydrous oxide—he could purify gas from sulphuretted hydrogen. He tried experiments upon it and found out its capabilities, and then took out a patent for the invention. After the patent was taken out he used it again, openly, at the Brick Lane works—not by way of experiment, but openly in the course of business.

The LORD CHIEF BARON: What date was that?

Mr. BOVILL: In 1840. Mr. Croll used it at first by way of experiment, to see whether it would answer, and having completed the discovery he took out the patent and published it to the world. He used it openly before the workmen as a means of purifying gas, not in the sense of experiments, as such were known in a court of law, but in the due practice of his invention. He embodied that invention in specifications, and did the very thing which Mr. Hills now claimed. His learned friends had repeated over and over again that this was by way of experiment merely, but he most emphatically denied that such was the case. His learned friend had asked—Why was not the use of the invention continued? To this the reply was simple enough. At that time there was a more ready claim for the residuum of the lime than there was for that produced by this process. While, therefore, they could sell their lime advantageously, and discharge their "blue billy" into the Thames, they felt it better, commercially speaking, to purify by means of the lime. [The learned counsel proceeded to read portions of the evidence on this point, commenting upon it at great length.]

The LORD CHIEF BARON: Will you have the kindness to point out that part of Croll's evidence which shows the method of revivification, and that the chlorides may be used for the same purpose.

Mr. BOVILL: If your lordships will refer to page 4, line 26, of the printed evidence, your lordships will see it. [Reads evidence.]

The LORD CHIEF BARON: Is that the mode by which the plaintiff does it?

Mr. CHAMBERS: Quite different, my lord.

Mr. BOVILL: The mode in which the plaintiff does it is by exposure to the air.

The LORD CHIEF BARON: Does the manganese require to be roasted? and is the iron capable of getting rid of the sulphur merely by exposure to the air?

Mr. CHAMBERS: Merely by exposure to the air.

Mr. BOVILL: I think not, my lord. The material does not require to be roasted; but, my lord, I may explain, before I go further, that it is not with reference to this process of renovation or revivification that I now address your lordships.

The LORD CHIEF BARON: Is it not claimed that Croll anticipated the revivifying process?

Mr. BOVILL: Not in that particular mode. That is not the case. Your lordship will find that Mr. Hills makes two distinct claims in his specification. He claims as a novelty his process of purifying gas by hydrated oxide of iron, and he claims as a separate and distinct matter the distinct specification upon which I am now on. I am afraid I had not clearly explained to your lordships how that matter was. All I am anxious that your lordships should clearly understand now is, that the identical thing which Mr. Hills thought fit to include in his specifications—which he did specify in 1850—was the identical thing that Mr. Croll had done in 1840. The question left to the jury as to what he had done was——

The LORD CHIEF BARON: Take down precisely the very passages in which each of these is shown.

Mr. BOVILL referred to Hills' specifications, at page 4 of the notes.

The LORD CHIEF BARON: "I take the sub-sulphate, the oxychlorides, or the hydrated or precipitated oxide of iron."

Mr. BOVILL: That is right. He says: "I take these things—or the hydrated or precipitated oxides of iron, which I prefer to use in a rather damp state." That is exactly what Croll did. I refer to Croll's evidence at page 339, and to Mr. Hills' at page 4, line 17 to 20.

The LORD CHIEF BARON: Is there in Croll's specifications anything which shows that what is mentioned by Hills at page 4, line 17, is the same as what Croll used?

Mr. Bovill: This only, the mention of the oxides of iron. I had better get your lordship's reference to Mr. Hills' specification before I proceed further.

The Lord Chief Baron (reading): "The same effect may be produced by a mixture of oxide of zinc and oxide of iron."

Mr. Bovill: Then, in order to make the comparison of Croll's evidence with Hills' specifications complete, we must refer to Hills' specification, page 5, line 33. "Hydrated or peroxide of iron may be conveniently prepared for this purpose by decomposing sulphate or muriate of iron with hydro-sulphuret of ammonia, or with lime, magnesia, &c.; they may then be mixed with sawdust, &c., and afterwards exposed to the air."

The Lord Chief Baron: Is there anything corresponding to that in Mr. Croll's evidence?

Mr. Bovill: Not in his patent. He does not describe how you are to make oxides; he takes them as things well known.

The Lord Chief Baron: If you had to compare specification with specification, the office of the court would be very different than it must be by comparing specification with oral testimony.

Mr. Bovill said that Croll treated the mode of obtaining these oxides as common knowledge. He said: "I obtain oxide of iron, &c." [reads evidence]. He would now introduce another fact, which was admitted on all sides in evidence, that ammoniacal liquor contains hydro-sulphuret of ammonia; and, if it were used with sulphate of iron, that the hydro-sulphuret of ammonia which is contained in ammoniacal liquor would precipitate the oxide of iron. That point was admitted in evidence.

The Lord Chief Baron: That is precipitated oxide.

Mr. Bovill: Precipitated or hydrated oxide, and the consequence was that, although Mr. Hills used the term hydro-sulphuret of ammonia, the term which Mr. Laming used, ammoniacal liquor, answered the same purpose because it contained the same substance. Mr. Laming said: "By ammoniacal liquor and also by means of lime, &c." In Hills' specification it was described as sulphate or muriate of iron, with hydro-sulphuret of ammonia or with lime; and, therefore, the fact was that Hills' and Laming's meant substantially the same thing. It stood, therefore, thus: that in the year 1840 Mr. Croll employed the same means to produce the same identical object as Mr. Hills did subsequently; that he used it for the same purpose, was successful, and took out a patent for the invention. In that state of things, the user, not being by way of trial or experiment simply, but a *bonâ fide* user after the patent had been obtained, is was now sought to support the verdict for Mr. Hills, which entitled him to a patent for that which Mr. Croll not only discovered and used, but also took out a patent for. He was quite sure that the jury in the space of time—only half an hour—which they took to consider their verdict, could not possibly discuss half the questions raised at the trial. To say nothing of himself, Sir Fitzroy Kelly made a long speech, and after the case had been heard he had no doubt, in his own mind, that the verdict would have been for the defendants.

Baron Bramwell: I don't think I summed up favourably to you on this part of the case.

Mr. Bovill: I will not say favourably, but the summing up was so clear, and your lordship made it so intelligible—I don't say there was a leaning either on one side or another—that I am quite sure—except it may be on one or two matters—no one in the whole court was more surprised than your lordship at the verdict. What was the question left to the jury on that part of the case? The other side contended that what had been done by Croll was in the nature of experiments, and a verdict could not possibly stand on such ground as that. He would now proceed to call attention to the cases in which the doctrine of experiments had been treated as involving a patent or not. He believed there was no single case to be found in the books—he spoke on the high authority of his learned friend, Mr. Webster—in which, after a man had taken out a patent, that the use of that could be treated as an experiment. He had not now dealt with the specifications, but, taking the actual user, he asked what question was left to the jury upon that user? Taking the question of Mr. Croll's specification itself, and the evidence on that point, the mode in which his learned friend on the other side left it to the jury, upon the specification or the practice, or both combined, as to whether the plaintiff was anticipated by Croll——

The Lord Chief Baron: The user of a patent takes a very different footing, and is entitled to much more consideration and respect than a mere experiment. The question, I don't at all think, is whether this was a user, because, if a man takes out a patent, he is not obliged to say, "I see at present that my invention will be of no use, because in the present state of a certain market the worse mode of dealing with the subject will continue to be used until a certain event happens, but, whenever that happens, then I will use my process." He is not obliged to say that. He is entitled, if he makes the discovery, to take out his patent; and it may be that he has never used it at all—that he has never made any experiments at all—that the thing exists only on paper; no one has used it in any other way. The real question will be this—"Does Croll's patent and specification anticipate that which is claimed by Mr. Hills, the plaintiff?"

Baron Bramwell: For this purpose, you may take the specification as you would a paper appearing in a scientific journal.

The Lord Chief Baron: In my view, it is entitled to rather more respect than that; there it is upon record.

Mr. Bovill: No doubt, my lord. The learned counsel said he desired to keep distinct the point respecting what really was done in the specification; when he came to treat upon that subject he was of opinion that their lordships would see that it made altogether an overwhelming argument. The other side relied upon their supposition that all Mr. Croll did was by way of experiment, and ended in nothing; and they referred to a lecture, delivered in 1844, he believed, before the Society of Arts, from which Sir Fitzroy Kelly read a particular passage, in which he (Mr. Croll) had said that the only practicable or useful manner of purifying gas was by means of lime. But his learned friend did not read the other portions of the report, from which it would appear that he was discussing the commercial view of the subject. Mr. Bovill then proceeded to read portions of Baron Bramwell's judgment, which he contended was only to be interpreted favourably to the defendants upon this point; and afterwards cited the cases of *Jones v. Pearce* and *Lewis v. Menling* in support of his argument.

The Lord Chief Baron: It cannot be laid down that it is a question always for the jury whether the use of a thing necessarily prevents anybody else taking out a patent for it. Suppose, in a particular manufacture, a man were to discover some convenient mode of making wheels or anything else, and were to use it on his premises, and to permit his workmen to use it, but afterwards discontinued it because he found that some other mode was preferable, or because there were commercial reasons, such as the demand for lime in this instance——

Baron Bramwell: There was the case of a man who invented wheels, used them till they wore out, and then discontinued them. What I endeavoured to do in this case—whether successfully or not I do not know, for I have a great doubt whether one-half was not a misdirection—what I endeavoured to do was to use the word "experiment" rather as illustrating a thing than laying down a positive rule, and accordingly I used the word "practice," if the practice was an open one; experiments, or what you please, if the practice of a user was an open one.

Mr. Bovill: At the end of the case I asked your lordship to nonsuit, but the other side insisted upon its going to the jury, and your lordship thought, in mercy to the parties, that it would be best to send it to the jury. Of course we don't complain of your lordship's leaving it to the jury, and, the points being reserved, of course to the jury it went. The learned counsel then quoted *Adamson's* case, as reported in the 25th *Law Journal*.

The Lord Chief Baron: The chemical evidence did not at all agree as to whether this was the specification of Mr. Croll or not.

Mr. Bovill: I will come to that in a moment.

Baron Bramwell: As far as the meaning of the words went, one set of chemists were prepared to say one thing and another set another thing. One set of chemists said, "Croll meant anhydrous," and another set maintained that he meant hydrated.

Mr. Bovill said he would notice that remark when he came to the specifications. He then proceeded to comment upon *Adamson's* case, and also cited the case of *Newall v. Elliot* (27th *Law Journal*).

The Lord Chief Baron: I wish you to lay down the way in which you put the case working under a patent, or working before a patent; and then afterwards, upon taking out a patent. Neither of these cases can be considered as experiments."

Mr. Bovill: I say they are neither of them experiments by way of trial.

Baron Watson: That the judge should say to the jury, "These are not experiments."

Mr. Bovill: In this case it was the user of a thing after the patent and publication to the world. Within the last month or so, the Lord Chief Justice held that a man making the batter of a churn, and showing it to two people—the bailiff of the farm and the dairymaid—although he only used it twice, defeated a patent.

Mr. Grove said there was no decision at all in that case.

Mr. Bovill said the case was not yet decided, but he ventured to say there was no case to be found in which it had been considered for an instant that the thing done by a person for which he had obtained a patent, and which he afterwards carried into effect practically in the course of his business, could, in point of law, be treated as experiments.

Baron Bramwell: I think it right to say that, though he purified with lime for commercial purposes, still his user of the invention was of an experimental kind. He used first one oxide and then another.

Mr. Bovill: Of course. He said they all succeeded—oxide of iron, manganese, oxide of zinc; but he did accomplish the result. He did so before he took out his patent, by way of experiment; then he tried it again, and then specified. There is not the slightest doubt in the world upon these facts, and I therefore ventured to intimate to my lord at the trial, and do so now, that it was actually a ground for nonsuit. The motion was not upon the ground that his lordship improperly left it to the jury. The point had been reserved, and then there was no other course but for his lordship to leave it to the jury. He was, therefore, entitled either to a nonsuit, or the evidence being so strong, it should not have been treated as one of experiment; and if so, the verdict was undoubtedly wrong, and on that point he was entitled to a new trial. The next point to which he would direct his argument was with respect to Mr. Croll's specifications. Having discovered his invention, he used it, and took out his patent in 1840—a patent for certain improvements in the manufacture of gas, and in the preparation of certain materials to be used in the manufacture of gas. He described the process for the purification of coal gas from ammonia. At page 2, and at line 21, he said, "It is proper here to state that after the gas has been submitted to this process, it should have another purification, in order to purify it from the remaining portion of sulphuretted hydrogen, which purification is to be effected by means of the oxides hereinafter described."

The Lord Chief Baron: Or in the ordinary way, by the use of lime.

Mr. Bovill said he need not trouble their lordships with anything more than that. In other portions of the specification the same effect was stated to be produced by oxide of zinc, oxide of iron, oxide of manganese, and treated exactly in the same way. He might, therefore, substitute for oxide of manganese in the specification, oxide of iron. [The learned counsel then read portions of the specification.] The thing which Mr. Croll did in his experiments before he took out the patent was to use the oxide of iron, and he then roasted it, sometimes to a red heat and sometimes not. So that it was sometimes hydrated and sometimes anhydrous, but still oxide of iron. What would anybody understand by that term? Would they understand, ordinarily speaking, hydrated oxide or not? He would show their lordships upon the clearest evidence on both sides of the question, because it came out at the cross-examination of the plaintiff's witnesses, as well as in the examination of his own, that the only thing that any person of chemical knowledge acquainted with such subjects would take would be the hydrated oxide of iron. This was exactly what Mr. Croll used. The contention in that suit was, that the plaintiff called witnesses to state that he said afterwards, "It is to be brought to a red heat;" and therefore it was assumed that he meant to use the anhydrous oxide. He would, however, take the liberty of reading five or six passages of the evidence on this part of the subject which would convince their lordships that such was not the case. The learned judge at the trial had distinctly laid down that if by the term oxide of iron Mr. Croll meant hydrated, or if the term, properly speaking, included hydrated oxide as well as anhydrous, then the plaintiff could not recover. That was his lordship's direction.

Baron Bramwell: If I laid that down, I laid that down which was wrong.

Mr. Bovill: I will point your lordship's attention to the passages where your lordship stated it.

Baron Bramwell: Very likely I may have stated it, but if I did I was wrong upon that point.

Mr. Bovill read portions of the learned judge's judgment at the Guildford Assizes.

Baron Bramwell: I am satisfied that is wrong—I mean those passages of mine—because, supposing Mr. Croll's specification means hydrated, it does not necessarily indicate the plaintiff's discovery, because it is not hydrated generally, but of that particular hydrate which is precipitated.

Mr. Bovill said it did not matter. Mr. Croll's was precipitated; and not only what he did, but what their own witnesses would understand. If they were told to take oxide of iron they would naturally take hydrated oxide—that which is precipitated.

Baron Bramwell: Those remarks of mine I am now satisfied were erroneous. What I ought to have said to the jury is this:—"Supposing

that you should be of opinion that the word 'oxides' includes the hydrated as well as the anhydrous, then if you are also of opinion"—I could not make the remark then, for I did not know the fact—"if you are also of opinion that though there are some hydrated oxides which will not purify, yet that the use of hydrated oxides which will purify is so indicated by these expressions, then you ought to return a verdict for the defendants." That is what I ought to have said.

Mr. BOVILL said it was very convenient for Mr. Grove to come and speak of a variety of hydrates which nobody knew of. Mr. Grove mentioned a number of hydrates, and called them by various names—and it might be affirmed that no one at the trial ever dreamt of many of them—it was very convenient for him to use that argument and to say there are all these various oxides which will not purify. He would not venture to give the names of the various oxides which Mr. Grove referred to. That gentleman happened to possess the valuable knowledge upon the subject which he did not; but it should be remembered that these statements were not in evidence at the trial. He wished to be quite clear about what the direction of the learned judge was to the jury at the trial.

Baron BRAMWELL: You cannot object to my direction more strongly than I do. I am quite convinced that it was wrong.

Mr. BOVILL having read and commented on some portions of the evidence, with the view to show that he was entitled either to a verdict or to a nonsuit,

Baron WATSON observed that there were various points raised in that evidence which were clearly matters for the jury to determine.

Mr. BOVILL said he was now supposing that there was no dispute upon the evidence as to the state of chemical knowledge at the time of these experiments, and that, in consequence, it was for the learned judge to put his construction upon the meaning of the expression, "oxide of iron."

Baron BRAMWELL: My construction was this:—Evidence was offered as to what was the state of chemical knowledge at that time; and then the judge, being placed in possession of the facts as to the state of knowledge at that time, it was for him to decide what that state of knowledge was.

The LORD CHIEF BARON: The judge cannot take the opinion of the jury upon one isolated fact in the case, and say—"Now tell me what you think of so and so;" and when they have stated their opinion upon that to say—"Well, if that is your opinion, I will nonsuit the plaintiff." All that the judge could say to the jury was—"If you are of opinion so and so, then I am of opinion that your verdict ought to be for the plaintiff." It should never be forgotten that a jury in all cases, civil and criminal, have a right to return a general verdict, and you cannot compel them to split the case up in parts. They have a right to say—"We would rather not answer any other questions than, first, 'Are you agreed on your verdict?' and 'Which way do you find?'"

Mr. BOVILL quoted the case of *Delarue v. Dickinson*, and referred at length to the evidence of Mr. Campbell, Dr. Taylor, and other witnesses.

Baron BRAMWELL said he thought that the language ought first to be interpreted in the sense of mere grammatical construction. Was there anything on the face of the documents to show that the language employed by Mr. Croll did not mean all the oxides of iron? It might be true that he used oxides of iron in the first instance, and that then afterwards they became anhydrous, and if the state of knowledge at the time was such that it was well known that the hydrated alone would answer the purpose, then he thought that the learned counsel need not labour at that point any more.

Mr. BOVILL said it seemed to him, with all deference, that if this point were conceded the verdict ought to be conclusive for the defendants.

Baron BRAMWELL again intimated that his summing up was in some particulars erroneous.

Mr. BOVILL argued that, if his lordship was wrong in his direction to the jury, they ought to have a new trial. At any rate he must assume that his lordship ought to have given some other direction. He did not know that it much mattered which way he took it. If his lordship's summing up was favourable towards him, that was a ground for the verdict to be set aside; and, on the other hand, if his lordship's direction was wrong, it was still an argument for a new trial.

Baron BRAMWELL: Upon my direction the verdict was against evidence; would the verdict have been against evidence upon what ought to have been my direction?

Mr. BOVILL contended that it would. It was very hard for them to have the direction one way, and then (as he contended), conclusively, the verdict to be against evidence as left to the jury; and then to be obliged to speculate what the verdict would have been if the summing up had been more unfavourable to the defendants. The probability was, that whatever the direction might have been, the jury would have found a verdict for the plaintiff. The jury could not say that his lordship misdirected them by adopting the course they took. He ventured, however, to take the whole facts of the case, and to present them before the court, and he contended that the verdict as it stood was against the evidence in any view that might be suggested. [He then proceeded to read the evidence of Dr. Miller, Dr. Odling, Mr. Thompson, and the other witnesses examined at the trial at Guildford, and to comment upon the evidence at considerable length.] Now, what was there opposed to this evidence? They maintained that the terms first used in Mr. Croll's specification included both hydrated and anhydrous oxides, but it appeared that any man of competent knowledge would have offered the hydrated.

Baron WATSON: According to your judgment Mr. Croll goes to make experiments.

Mr. BOVILL said the experiments had been already made. It was a most singular thing that Mr. Croll made the discovery without actually knowing it at first. It was proved incontrovertibly that he used the oxides of iron. It appeared to him that it was generally known that hydrated oxide absorbed sulphuretted hydrogen, and the workmen took that substance—namely, hydrated oxide—because Mr. Croll told them to do so in language which they understood, though he used the term "oxide of iron." If they attempted to fix a meaning to the term "oxide of iron," and made it to include both hydrated and anhydrous, it was not competent for witnesses to come forward and say that it meant anhydrous alone.

Baron BRAMWELL: I observe that Sir Fitzroy Kelly, in addressing the jury, says—"As to Mr. Croll's patent, is this a patent for anhydrous oxide, or a patent for hydrated oxide?" He also went on to state that Mr. Croll having made it public that hydrated oxide would effect the purification specifically in the way in which he applied it, it might be that the jury felt—"Well, you have left a long question to us, for if it means both oxides, still it does not tell the public."

Mr. BOVILL said the anhydrous oxide required the operation of roasting to make it anhydrous. The normal state of oxide of iron was anhydrous. Then, supposing that the question was whether the specification pointed out the hydrated oxide, he maintained, in the ordinary construction of language, also taking into consideration the chemical knowledge at the time, that it would point to both. Supposing they departed from ordinary construction, and referred to what people really did understand by it, he felt that his evidence warranted him in saying that scientific persons would use the hydrated. Independently of these considerations, however, the patent was to be taken as a publication. The state of knowledge at the time perhaps indicated that either anhydrous or hydrated oxides would do. If a person said, "Oxides will do," was it right for anybody to say only one or two particular ones will do it?

Baron BRAMWELL: Supposing it were published in a book as common knowledge, "Hydrated oxide of iron will absorb sulphuretted hydrogen?"

Mr. BOVILL said at that time it was not known that anhydrous would do it: now it was known that it would. Supposing a person had said, "Hydrated oxides of iron will purify gas?"

Baron BRAMWELL: Suppose he had said, "That is true, but not the whole truth. There are ten thousand hydrates of iron, and only one or six will do it?"

Mr. BOVILL submitted that Mr. Hills could not take out a patent, because it was common knowledge that oxides would do it.

Baron BRAMWELL: Suppose a previous announcement had been made, to the effect that some of the hydrated would do it?

Mr. BOVILL said his lordship must be satisfied that anybody who knew anything about chemistry would have taken hydrated oxide of iron. Mr. Croll's meaning was understood by the workmen when he spoke of oxides of iron. If the case had been left to the jury upon that point, the jury ought to have found that it was so indicated.

Baron BRAMWELL thought that the effect of the testimony was this, that if a person had read in a book that oxides might be used, he would immediately have said, "I know what this man means—he means an artificial burnt oxide." The witnesses did not say that it was true, but they did say that supposing they had read such a thing, they would have experimented upon the data this supplied them.

Mr. BOVILL maintained that his lordship hardly did justice to what the witnesses said, and read portions of Dr. Miller's evidence to show that it was well understood that hydrated was the proper material to be employed.

Baron WATSON: The witness says, "I *should* have tried it." He does not say, "I *did* use it."

Mr. BOVILL said he would assume that. Supposing anybody had published that oxides of iron would absorb sulphuretted hydrogen from gas, without saying which, and that another person afterwards took out a patent for naming the particular oxides which would do it. In that case, he should be very much surprised if the court should sanction such a thing, and, with the evidence before them, he thought it would be impossible to support the verdict of the jury, that Mr. Hills' patent was different to that which Mr. Croll specified. [The learned counsel proceeded to comment upon other portions of the evidence, and then took up the third point of his argument, namely, that with reference to Mr. Laming's patent.] He said he would again call the attention of the court to the observation he addressed to them before, as to Mr. Hills never having attempted to patent this invention before August, 1848. It should be understood that the most studied attempt was manifested to disguise words and language, and to represent the same thing in terms which tended to deceive people, for the very purpose of endeavouring to make it appear that Mr. Hills' was a new discovery. Now, Mr. Laming was aware of Mr. Croll's patent. He, therefore, did not by his patent seek to make out that he had made any great discovery by the use of oxide of iron. He did not claim that as a part of his invention; but though he did not claim any merit for the discovery of oxide of iron for the purification of gas, yet, knowing of Mr. Croll's patent, which was taken out in the year 1847, he took out his patent for improvements in the manner of using chloride of calcium. This chloride of calcium was nothing more or less than hydrated oxide of iron.

Baron BRAMWELL: No, no.

Mr. BOVILL said he had not finished his sentence. The muriate of iron and lime mixed together produced what was called chloride of calcium, intermixed with hydrated oxide of iron, and the two were mechanically, but not chemically, combined. If that substance were used for the purification of gas, either by itself or by mixing it with sawdust or any other porous material, what Mr. Laming spoke of referred to the mode of using this, knowing that he could not claim the material itself. But in the course of his patent he went on to give a variety of explanations, the effect of which was to tell the world how gas was purified, and he told them to do so in a manner which the learned counsel would convince their lordships was precisely the same as that by which Mr. Hills accomplished the same result.

Mr. BOVILL then read from Mr. Laming's specifications, and commented upon them and the evidence at great length, and demanded whether, after this publication of Mr. Laming in 1847, Mr. Hills had any right to come forward and say, "I now claim the use of these oxides and carbonates as prepared with muriate of iron and lime; I claim them for the purification of gas, and I claim them as hydrated oxide of iron?" It stood upon the evidence that if muriate of magnesia were used, it produced just the same deliquescent substance as the chloride of calcium. He would call their lordships' attention to the evidence on that point, which showed that it was a mere idle difference, and that there was no foundation whatever for any real distinction between the gases. In Dr. Miller's evidence, it appeared that that gentleman sought to make a distinction between them. He said that they could not use chloride of calcium, because it produced a deliquescent substance. But immediately that the distinction was attempted to be made, the learned counsel, with the assistance of the chemists, found out that the witness had been mixing every substance which produced precisely the same effects as muriate of magnesia. The mixture was of course a different one, but the effect produced—the purification of gas—was the same. Muriate of iron and lime was to be found in both the patents. How was it, then, that Mr. Hills said that there was no statement published that they could purify gas from sulphuretted hydrogen by the process which he named? He maintained that manifest injustice would be done if Mr. Hills was allowed to take a patent for that which was first discovered by Mr. Croll, and then by Mr. Hills actually showing the same thing in his specification, and then claiming it either alone or in conjunction with any other known material.

Baron BRAMWELL said there was one thing which struck him as being most extraordinary. They knew as a fact that oxide and muriate or sulphate, or whatever they called it, were used, for Laming said, "You may produce the oxide with the sulphate or the muriate of lime." Hills never could have intended to prepare it with the muriate of lime, because he went on to claim the use of oxide either alone or with a variety of things which he named, sulphate of lime, muriate of magnesia, &c. He therefore must have read Laming's patent; he must have said to himself, "I must not put in that I use it with muriate of iron; I must not say that part of the combination results from muriate of lime. That won't do—(that is chloride of

calcium)—but I am still at liberty to say that I purify with oxide—with muriate of iron, provided I don't say that I afterwards use it together." But he never contemplated making it in any way except in such a way as he did use it. It struck me, therefore, that he had most studiously said as much as he could, but at the same time that he took care to avoid Laming's patent, which gave one a feeling of suspicion that Laming's patent directly suggested the matter to Hills. But what then? That was a question for the jury.

Mr. BOVILL said he did not think that his lordship quite appreciated his argument.

Baron BRAMWELL said they impressed him very much at the trial, and he summed up so far in favour of the defendants. But supposing the plaintiff left out how he produced it, what would the learned counsel have then said as to his claim to use oxide either alone or in conjunction with anything named by Laming? It might have been said, "With some of these things in combination we did profess to use it, and therefore the patent is bad." But that was a question for the jury.

Mr. BOVILL said that was not quite the question he submitted to the jury.

Baron BRAMWELL: Do not suppose I am making that remark adverse to you at all.

Mr. BOVILL said, with deference, that was not the proper way of looking at it, and he would tell his lordship why. It was quite clear that Hills had taken Laming's patent, and had avoided taking anything which Laming claimed. But what Laming claimed was that Hills had put in his patent that which Laming gave to the world, and had claimed previously as his own.

The LORD CHIEF BARON said it was true that Hills had left out the manner in which he had got at part of his specification, and the effect of his stating how it was to be prepared was to show it. Chemical knowledge was not in the same advanced state in the minds of ignorant persons as the ordinary processes of manufacture were. But the effect of his stating how he got it was to show it. The moment any child was asked about it, his answer would be, "This statement of how Hills takes it shows precisely that it was that which Laming used before."

Baron BRAMWELL remarked that this further was to be said—Hills claimed the use of muriate of iron in conjunction with magnesia. But the two things performed identically the same operation, and were open to the same objections. Whatever was true of the one was true of the other, except that they were different mechanically. The court could not say that they consented to the proposition that the two substances were identical, or that they were in the nature of chemical equivalents, because it could not be presumed to know enough of chemistry to say so. But witnesses were called to say that they were chemically equivalents.

Mr. BOVILL said that Mr. Laming's point was that he could purify gas from sulphuretted hydrogen by mixing muriate of iron and lime. Well, how was that? It was the oxide of iron contained in the mixture which purified the gas from sulphuretted hydrogen. How could any one, therefore, come afterwards and say, "I claim purification of coal gas by hydrated oxide of iron, which you may produce by muriate of iron and lime." It was not the question of what Laming claimed. He claimed it alone or as mixed with other things which he claimed. If he claimed it alone he was taking a specific patent for what had been known before—known by Croll. The simple mode of applying it was known by Mr. Laming in combination with another thing.

Baron BRAMWELL: I do not want to repeat. The plaintiff says, "I use oxide of iron either alone or with something different from Mr. Laming's;" and it is admitted. I put the question to the jury distinctly: when you find it admitted that the action of hydrated oxide of iron and muriate of magnesia, or the hydrated oxide of iron and muriate of lime, are identical for this purpose, you should find that the one is merely a representative and equivalent for the other.

Mr. BOVILL: That is merely the state of the case.

Baron BRAMWELL: Suppose the question were put to the jury distinctly, what answer must they give?

Mr. BOVILL: That clearly they are the same. I do not see how your lordship can arrive at any other conclusion upon this evidence.

Baron BRAMWELL: Either I could not have put the question clearly, or they must have answered it in the negative.

Mr. BOVILL said that Mr. Hills claimed a patent for the very same thing that Mr. Laming had patented. Mr. Laming said, "I mix muriate of iron and lime—the oxides which result are useful for the purification of gas." Could anything be more clear? Nevertheless, Mr. Hills said, "I claim to use the hydrated oxide of iron for purification of gas," which hydrated oxide could be produced by muriate of iron and lime, being the identical means which Mr. Laming has stated in his specification—not specified, but stated.

Baron BRAMWELL: I really do think it right to tell you that this point of magnesia was not very clearly put to the jury.

The LORD CHIEF BARON: Certainly; my experience in patent cases, and in some other cases, has been this: that if, in defending a case, you produce everything, and make no selection of those points which are good and intelligible, but produce everything to the jury, it is not surprising to find that now and then they found their trust on two or three points which may not be worthy of their attention, and lump the rest all together.

Mr. BOVILL said it was very likely that this was the case in the present instance.

Baron BRAMWELL: I must say, Mr. Bovill, that you only made one bad point.

Mr. BOVILL: The carbonates, my lord?

Baron BRAMWELL: Exactly.

Mr. BOVILL: I have not argued that point to-day.

Baron BRAMWELL: Now you are attacking part of the plaintiff's patent only. He had specified for the combination, not making a specific claim for the use of hydrated oxide, but for its use in combination.

Baron WATSON said that if Mr. Hills discovered that which Mr. Laming could not do by his patent, the jury had exercised their good sense indeed.

Mr. BOVILL: I tell your lordship that the reason why this process was not used was because we permitted the "blue billy" to go into the Thames.

Baron WATSON said he had seen similar cases where the jury had said, in reference to old patents, "This is identically the same as the other; so far it is very good, but nobody has been benefited by it." It could not be denied that under Croll's patent and Laming's patent the "blue billy" was still allowed to go into the Thames.

Mr. BOVILL contended that the abolition of the "blue billy" depended upon other circumstances, such as the state of the market and the sanitary arrangements of the locality. He trusted he had not wasted their lordships' time.

The LORD CHIEF BARON said he was bound to say that the court did not think the learned counsel had wasted a moment. He had listened with great attention, and he did not think that a moment of time had been occupied longer than was due to the importance of the case.

Mr. BOVILL said the next point was one about which their friends thought very lightly. When he moved the rule he drew attention to the state of chemical knowledge at the time when this patent was obtained. This was the fourth and last point which he would submit to their lordships' consideration. It was then well known that hydrated oxide of iron would absorb sulphuretted hydrogen, and therefore it was not competent for a man to take out a patent to absorb sulphuretted hydrogen by means of hydrated oxide of iron. The last case of a similar nature was one in which a Mr. Higgs sought to obtain a patent for deodorizing and purifying sewerage water by means of muriate of lime. The effect of muriate of lime was to precipitate the filth, and not only to precipitate the filth which was held in suspension in the water, but also to precipitate the filth which was held in solution in the water, which was a peculiar property. Still it was common knowledge that hydrates of lime would produce that effect. Mr. Higgs took out a patent, as he said, for deodorizing and purifying sewerage water. The case was disputed, and it was heard by the Court of Queen's Bench, and the patent could not be supported for the application of a known substance for a known purpose, although it had never been applied to sewerage water before. The case was reported in the 31st vol. of the *Law Times*. The learned counsel referred to the case of *Brook v. Aston* and other cases in support of his argument. He would apply these cases to the present one. It was known that hydrated oxide of iron would absorb sulphuretted hydrogen generally. That was common knowledge.

The LORD CHIEF BARON said he remembered a case in which it was discovered that to pass muslin over argand lamps would get rid of the sulphurous particles. Gas was discovered, and it was applied through argand lamps, and then somebody said, "Well now, that being the case, I will apply your argand lamps for the purpose of clearing muslin and lace;" and that was done. Now if anybody were to be told that he could absorb sulphuretted hydrogen from gas by the same substance that was used to deodorize the sewerage, would not the man who put it in this shape be entitled to a patent?

Mr. BOVILL: Quite so; but Mr. Hills has not done that, because he claimed a particular mode of applying hydrated oxide to gas. If Mr. Hills had come forward and propounded a particular plan for doing it, which was not stated by a previous patentee, the jury would then have found that he was entitled to a patent. But this was not what Mr. Hills did. He professed to purify gas by passing it through the precipitate of oxide of iron. He did not say so in so many words, but it was the application of a known substance for a known purpose.

WEDNESDAY, NOV. 23.

Mr. WEBSTER, who followed Mr. Bovill on the same side, commenced his argument by contending that in point of law the verdict of the jury ought to have been entered for the defendants, or else that a nonsuit should have been directed. The fact to which Mr. Bovill had referred yesterday, with respect to the taking out of the several patents, was very strongly commented on in favour of Mr. Hills; but there were a great number of other facts, to some of which his friend had referred, which he thought would satisfy their lordships that the verdict was against evidence. That which his learned friend had not called attention to which was most material to the defendants was the undoubted fact that Mr. Laming had been the inventor as early as September, 1848—that it was made subject to a French patent in February, 1849. Was it to be believed that in a matter of that importance, if Mr. Hills had been in the possession of this invention in August, 1848, he having a patent filed in October, 1848, under a title sufficiently large to have included the discovery—that it should not have been found in that patent? Their lordships would remember that Mr. Alfred Vincent Newton attended before the Attorney-General with Mr. Laming in September, 1848, when a paper was handed in to the law officer, containing a statement to this effect:—"I simply expose to the air the sulphuret of iron which results from the purification of illuminating gas by hydrated peroxide of iron, &c." This was a most important piece of evidence. It should be observed that this was in opposition to Mr. Hills' patent of 1848, and contained the very process of revivification which was now become of so much importance. [Reads evidence.]

Baron BRAMWELL: I don't think you need labour at that. It is clear Mr. Laming had found it out before; the French patent proved that beyond all doubt.

Mr. WEBSTER said a very important question in the case would be, what were the inventions? and the learned judge (Bramwell) had left the point to the jury upon the intelligible facts of the case. Hills asserted that he was in possession of the revivification in 1848. It appeared clear, from the evidence, that Laming discovered it in 1847, and made it subject to a French patent in 1849. It was quite clear, whatever their lordships might think in connexion with the thunder-storm and other facts upon which he need not trouble the court, that Laming was in possession of the invention as early as 1848—that he made it subject to a French patent—that Evans discovered it in 1849—that Laming said to Evans, "You have discovered my secret"—that they applied for an English patent, which was opposed before Sir John Romilly under circumstances which he need not mention. Was it to be believed that, if a man with the knowledge of Mr. Hills had been in possession of this simple fact of the revivification by exposure to the air, he would have used the description of it which was found in his specification? It was inexplicable except upon the supposition that he designed to disguise it. They must remember that he had been opposed by Mr. Laming in his prior patent in 1848, on which occasion the latter had successfully laid before the Attorney-General a paper which described, in the clearest possible terms, that very revivification. He maintained, therefore, that, looking at the conduct of the parties, all those facts became most material. One word upon the terms of the deposit-paper in connexion with the specification. That paper was made on the 31st of November, 1849. Mr. Hills alleged that he had been experimenting for a long time, and the only paragraph which contained any reference to it was that one respecting the absorption of sulphuretted hydrogen and other gases in porous bodies, and the removing them again either by heat, &c., or by atmospheric pressure. Now, removing them by heat was Mr. Croll's invention. He (Croll) had absorbed gases into porous bodies, and had removed them by heat, and, in the progress of these experiments, he discovered that simple exposure would produce revivification. Up to this point there was nothing whatever that was new. It was the same thing in every respect as that which Mr. Croll had done. The term "removal of atmospheric pressure," he contended, pointed to a totally different mode, and he should certainly have expected a very different description of his process to what he found if Mr. Hills had really been in possession of the discovery of revivification by simple expo-

sure to the air. If Mr. Hills had spoken specifically of the process in the same terms as Mr. Laming, of course the latter would have opposed his patent successfully on the very deposit-paper. He would now call their lordships' attention more particularly to the evidence of Mr. Thompson, where he said that in August, 1849, his attention was called by Mr. Evans to what was called a curious thing in the gas-works, which turned out to be the process of revivification as above described. [Reads evidence.] He (Mr. Thompson) took some of the material away, and analyzed it. The date of the analysis was September 7, 1849, and he found the substance to contain hydrated oxide of iron, carbonate of lime, sulphate of lime, and sawdust with sulphur. This substance had been given to Mr. Evans by Mr. Laming. Mr. Hills successfully opposed Laming and Evans on this patent, because the practice of the law officers that if any part of the patent was in the possession of another inventor, it could not be obtained unless the other parties concurred in the application. A *scire facias* was issued for the repeal of the patent in 1852, and it was repealed, though on what grounds it did not appear. This was undoubtedly proved to be Laming's discovery, however—first, by the deposit-paper, according to Mr. Newton's evidence; secondly, by the French patent; and, thirdly, by the conversation between Laming and Evans at the works. There was one other fact of the case, which he thought ought not to be omitted from their lordships' consideration, because they were now considering whether there had not been a substantial miscarriage about the verdict. Hills applied for a disclaimer, which was granted on November 11, 1853, but for nearly three years did he keep that disclaimer in his pocket, and the public were left under the impression that the patent was wholly invalid. There was one matter arising from the disclaimer to which he wished to call attention. The disclaimer, in point of fact, extended the right of patent, inasmuch as it claimed all the oxides, whether hydrated or precipitate. The learned counsel here read passages from Baron Bramwell's judgment at the assizes, in which the learned judge directed the jury that Mr. Croll claimed all the oxides of iron in the most general terms. In paragraph 14 of the specification, Mr. Hills went on to speak of the manner in which the hydrated oxide was prepared. As the specification originally stood there was a limitation, and therefore that which was contended for might have been possible—namely, that one might read the words hydrated or precipitated. That, however, was now done with, and, therefore, one was bound to give the full effect to the words of the specification—namely, that the word "or" was not conjunctive, but disjunctive. The claim, then, as it stood was this—that he purified coal gas with hydrated oxide of iron from whatever source he obtained it. He proceeded to contend that by this disclaimer the plaintiff got rid of everything which could be called limitation in the way in which he patented his oxides. It was, therefore, proper that they should give to the words their ordinary meaning, and read hydrated or precipitated, or precipitated or hydrated, from whatever source obtained. It was quite clear that there were various oxides which would not answer. He did not say which those were. He could not but imagine that their lordships had been a little misled by Mr. Grove on the question, and that his learned friend had treated it as an abstract principle. There could be no objection to that course. There were a great many oxides of iron, and it was not to be supposed that a person, by putting in the whole of a class, some of which would answer and some of which would not, could exclude a subsequent party from selecting from that class what would answer. That was his learned friend's argument. He should say, on the other hand, that a person could not get a patent for selection; that although that prior patent might be bad, inasmuch as it was disclaimed, the public could not have a patent for some one of that class of things. That was laid down in the case of *Betts v. Menzies*, as reported in the 27th *Law Journal*.

The ATTORNEY-GENERAL: There is an appeal coming on in that case.

Mr. WEBSTER said, even if it were not so, Mr. Croll would be subject to an action at the suit of Hills. Mr. Laming himself would be subject to an action for what he did long before Hills' patent, for the law gave credit to what was said in the specifications, without reference to the question of use. Any prior patentee might be restricted by any subsequent patentee from using what he had disclosed to the public. The argument that there were many substances, and, therefore, it could not be assumed which was meant, was not valid, because any person of experience in the manufacture of gas would immediately select the hydrated oxide. There was no dispute about what Mr. Croll did, nor about what Mr. Laming did. The only question was, whether it was a question for the learned judge or the court, or whether it was a question for the jury. His learned friends on the other side had endeavoured to represent that what Mr. Croll did was purely experimental. It was no such thing. Was there any case on the books in which what was published to the world in the specification of a patent was ever treated as experiment? Whatever was specified in the patent had been always held to be conclusive, and although as to its being the subject of a subsequent patent, although nothing had been done upon the first. He referred their lordships to the case of *Household Co. v. Neilson*, in which it was contended that an invention, although perfect, although made the subject of a patent, but not used, would not invalidate a subsequent patent. That case was decided; it was before the House of Lords.

The LORD CHIEF BARON: It surely has not been decided in the House of Lords that a prior patent and specification, if it failed in practice, would invalidate a subsequent patent?

Mr. WEBSTER: No, it was decided in Scotland.

The LORD CHIEF BARON: If the patent of Mr. Laming or Mr. Croll had contained in words that which was the very essence of the patent of Hills, there cannot be any doubt that the judge might have withdrawn the case from the jury, as I did in a case of *Bush v. Fox*—a proceeding of mine afterwards sanctioned in the House of Lords. But it is not the case here.

Mr. WEBSTER said that that was not the case *literatim*, but it was substantially, because when they came to have the matter explained by evidence, it was quite clear that Mr. Croll could not do the thing in 1840 which he then did, if Mr. Hills' patent was to stand. And inasmuch as the Lord Chief Baron withdrew from the jury the question of comparison between the two specifications, and said that it was for his lordship and the court, and not for the jury, to determine, was it not also proper in this case, when the terms of art had been explained to their lordships, to withdraw the case also from the jury, and to direct a nonsuit?

The LORD CHIEF BARON: That cannot be done. You cannot put to the jury a single question as to the meaning of a certain term. You can only put to the jury, Will you find a verdict for the plaintiff or the defendant?

Mr. WEBSTER said it was immaterial which way it was, so long as they succeeded in their object. But inasmuch as their lordships at one period of the day might be better informed upon the subject than at another, it did seem absurd to say, "As the court has informed itself by reference to some source of knowledge, it now leaves the case to the decision of twelve jurymen." That is all he was contending for.

The LORD CHIEF BARON: I think the advance of general intelligence was such that this did not require so much a knowledge of chemistry as of manufacture. The judge certainly might nonsuit without asking the jury. That was done in the case respecting a chain cable which came under my attention some time ago.

Mr. WEBSTER said that they were much embarrassed by the position in which they stood in this case. On the question of a nonsuit or a verdict for the defendants, what he had to submit was that, inasmuch as their lordships were presumed to know everything——

The LORD CHIEF BARON: We are presumed to know nothing but *all* the laws and *all* the Acts of Parliament that ever were passed. (Laughter.)

Baron BRAMWELL: Our ignorance is supposed to go to this extent, that we do not know that Dublin was in Ireland. (Renewed laughter.)

Baron WATSON: A learned judge said in the Court of Exchequer that he knew what a turnip was, but not a swede turnip.

Mr. WEBSTER: If it could be perfectly clear that what Croll did would have been a subject of infringement under Hills' patent, then Croll's patent could not be considered invalid so long as it contained that which was subsequently put forward by Hills. Could there be the least doubt as to what Mr. Croll did? The specifications certainly spoke for themselves. All Mr. Croll did was to use hydrated oxide for the purification of gas, which, having been placed on the top of the retorts so as to be brought to a sufficient heat, whether dull or red was not material, to get rid of the sulphur, and being stirred about and exposed to the air, was used again for the purification of gas. There could be no doubt on that point. If they wanted any confirmation, they had it in the evidence of Mr. King of Liverpool. [Reads evidence.]

The LORD CHIEF BARON: I take the expressions "hydrated" or "precipitated" to be interchangeable.

Baron BRAMWELL: There is no doubt he used oxide of iron.

Mr. WEBSTER maintained that such usage was not experimental, but that there was a patent taken out and a specification enrolled. The only use of the word "experiment," in connexion with what Mr. Croll did, was his using an experimental apparatus.

Baron BRAMWELL: Suppose a man took out a patent for some improvements, but specified the thing so that it was perfectly unintelligible, and that nobody could tell what he meant. And supposing that before his specification or afterwards, in his own private room, unknown to anybody else, he had practised it, you would here have an unintelligible specification and an unknown practice. Do you mean to say that that would preclude another patent on the same subject?

Mr. WEBSTER: No, my lord.

Baron BRAMWELL: The difference is one of degree, because witnesses say that Croll's specification was not intelligible, did not point out to them Mr Hills' invention; and there is evidence to show that there was no known practice of the invention but what might be called a sort of privy practice.

Mr. WEBSTER maintained that a fallacy had been imported into this case. Mr. Grove had put to their lordships a very striking case, with which their lordships were sure to be impressed. What Mr. Hills did was perfectly clear, and he could not have expressed in better terms than he had done—namely, that he made 20,000 cubic feet of gas for several days in an experimental apparatus used for all purposes, in which gas was made in an ordinary manner. The learned counsel then cited the case of *Heath v. Smith*, in the Queen's Bench, in support of his argument, and contended that there was no dispute about the fact that hydrated oxide was used by Mr. Croll, and that whether it was rendered anhydrous or not was wholly immaterial. He might pursue a similar line of argument with respect to Mr. Laming's patent; but his learned friend, Mr. Denman, would have something to say upon that part of the case. He maintained, therefore, that if there could be no doubt as to what Mr. Croll did, that the point of law being reserved, the verdict of the jury ought to be set aside.

Baron WATSON: Do you say that brother Bramwell ought not to have left to the jury the question of experiments?

Mr. WEBSTER replied that so far as the learned judge had left the question of experiments to the jury it was a mistake. He was not arguing that point now. The question of what was for the court and what was for the jury was of great importance, and had been considered in a recent case—he referred to the case of *Booth v. Kennard*. It had been said that all questions arising upon the facts of the case were for the jury. It was, no doubt, the Court of Queen's Bench that decided that. But in the subsequent case of appeal from the Queen's Bench, in the case of *Higgens v. Seal*, which was reported in the 8th *Queen's Bench*, and the case of *Brook v. Aston*, as reported in the 20th *Law Journal*—in both those cases the ground of appeal took the facts which had been submitted to the jury, and said that "there was no evidence for the jury in either of those cases." In point of fact, they adopted the principle of law, which undoubtedly would be the true principle, the judge being satisfied that he understood the terms of art, and the facts being sufficiently ascertained. That being the case, it became a question to which the learned judge would direct a verdict as concerning the law of the case. He trusted that, upon the grounds he had mentioned, the verdict of the jury would not be sustained.

Mr. DENMAN, on the same side, said he should be unwilling to trouble their lordships at very great length, but he felt, from the indications which had been given from time to time, that it was his duty to go through the case carefully; and, having done so, he believed he should be able to satisfy the court beyond all question that there was a want of justice in the verdict of the jury, and that the plaintiff had obtained by that verdict the benefit of an invention which, in point of fact, was not his. He would first make one or two observations on some ingenious arguments thrown out by the other side, and especially by Sir Fitzroy Kelly. It was his conviction that through these fallacies alone the jury had come to the conclusion they had. The learned judge who presided at the trial would remember that the mode in which the case was shaped by Sir Fitzroy Kelly and corroborated by the witnesses, until they were driven from it by cross-examination in every point, was this:—We shall satisfy the jury that anhydrous oxide alone is meant by Mr. Croll. They had said that inasmuch as Croll meant anhydrous alone, Hills could not be said to have taken his invention because he used the hydrated—the compound oxide. But it could not be said that one was more compound or more simple than the other. It was a fallacious mode of putting it to the jury, and that fallacy went through the whole argument. It was so put to the jury, and their verdict was obtained in its favour. There was another fallacy—namely, that Mr. Croll abandoned the experiments, and that they were useless so far as Mr. Croll himself was concerned. That fallacy was worked over and over again, with all the Attorney-General's skill—that if Mr. Croll had invented this, he would not have laid it aside. But it should be remembered that there were other circumstances which rendered the use of the lime preferable in a commercial sense, and that those circumstances became valueless when it be-

came impossible any longer to turn the "blue billy" into the river. His learned friend, Mr. Grove, had put it that Mr. Croll had admitted that he had failed.

Baron BRAMWELL: He would not have said that he failed, unless he said that his patent failed too. Did Mr. Croll do what the patentee did?

Mr. DENMAN: That is one of the general observations I would make.

Baron BRAMWELL: And the point is, that he used different things, and instead of resorting to the simple expedient of stirring the thing about and letting the air get into it, he thought it necessary to roast it awhile.

Mr. DENMAN said that, so far as revivification was concerned, it would probably be difficult to say that he had anticipated improvement; but, so far as hydrated oxide was concerned, he did anticipate its use. It certainly did appear to him that the observations of his friend, Mr. Webster, with respect to what Mr. Croll had done, were entitled to the very greatest weight, at all events in this sense. Mr. Webster had contended that there had been something in the nature of a misdirection in not telling the jury that what Mr. Croll did, really did defeat the plaintiff's patent, but he (Mr. Denman) could not argue the point of misdirection now, but he could say this, that if the case was nearly so strong as that, then *à fortiori* it was a case in which the verdict was against evidence. Then, again, it was a part of the argument on the other side that there was a question for the jury upon Mr. Croll's patent as to what was the state of chemical knowledge at the time. Now there was a question for the jury upon that point, but really the evidence upon the subject was entirely one way. There was no doubt whatever about the state of knowledge at that time. There was no doubt that at the commencement they began by stating that at that time the state of chemical knowledge was this, that you might take anhydrous. Upon the specifications they said so, but when it came to the evidence as to the state of chemical knowledge there was no dispute whatever. It was shown on the part of the defendants that Mr. Croll not only tried hydrated, but that he took it, because he knew that it would purify gas. This was the experience of Dr. Odling on the subject. There were one or two remarks he would make upon Mr. Croll's specifications. He clearly told the world that hydrated oxide of iron would purify coal gas. Mr. Grove said that Croll's specification did not tell the world anything at all, because it told them that only oxides of iron would purify. That was another fallacy. What was contended was this, that Mr. Croll meant anhydrous and that he purified with it. What Mr. Grove had contended was this, that they did not know what was meant, because Mr. Croll had said "oxides will purify." Their lordships would see that there were only two kinds of oxides, so far as the purification of gas was concerned—namely, hydrated and anhydrous. So far as that was concerned, it was perfectly idle to say that there were many oxides published to the world, therefore it came to this, that there were two sorts and things both in use. A person had taken out a patent telling the world that there were only two things that would do it—one that had water compounded with it, and one that had not. Consequently, when his friends argued that there were a thousand things that were included in the term "oxides of iron," they argued upon a fallacy, for there were not a thousand things which were applicable to this case.

The LORD CHIEF BARON: If a man were to take out a patent for doing something with two things, A and B; and if it should turn out that A will do it, and that B will not do it, that would not justify anybody else in taking out a patent for A.

Mr. DENMAN said that that was exactly what he meant. Mr. Hills had subsequently done what Mr. Croll had done before him.

The LORD CHIEF BARON: The jury have found differently.

Mr. DENMAN: If they have done so it was clearly contrary to the evidence.

Baron BRAMWELL: I am satisfied that I ought not to have left the question so to the jury. I ought to have said, "He speaks of all the oxides; some of them will not do, and some of them will. That being so, this patent (Hills') certainly indicates what oxide ought to be used." That is the question which I ought to have put.

Mr. DENMAN said he did not admit that his lordship had put the question wrongly to the jury, with reference to the circumstances of the case. It was that point which he had intended to meet.

Baron BRAMWELL: Suppose a man were to publish an article in some scientific journal, and to say, "Some of the oxides of iron will purify;" you surely will not say, nor would anybody think of saying, "Well, there are a thousand oxides—only five will do it; and therefore the man who finds out what oxides will do, is not entitled to have a patent?"

Mr. DENMAN said that was a fallacy introduced by Mr. Grove. It was right that the jury should try it, if it were put so. But, notwithstanding his exalted opinion of his learned friend's integrity and high character, he could not think that his opinion and argument upon the subject in that case were entitled to such weight as if he were lecturing in a scientific hall before medical students.

Mr. GROVE: The chemists said that native oxides would not do it.

Mr. DENMAN maintained that it was clearly known, at the time of this specification, that hydrated oxide was the proper one to be employed; and therefore it was a question as to degree, and one upon which the verdict of the jury was against the evidence upon that point. A great deal had been said about Mr. Laming's practice, but he maintained that there was even a stronger case of user by Mr. Laming of his invention, than there was by Mr. Croll of his.

The LORD CHIEF BARON: Is it not quite clear that what Mr. Laming proposes to use is the hydrated oxide of iron?

Mr. DENMAN said it was quite clear that it was so. Laming was continually watching Hills' patent, and Hills continually watching Laming's.

Mr. GROVE: I do not think that that is so.

Mr. DENMAN said their lordships would remember that there was evidence to the effect that Hills undoubtedly took out a patent in September, 1848; and their lordships had had their attention called to that patent. It was plain it did not say anything with reference to sulphuretted hydrogen. Laming, however, having the invention in his head, and Hills becoming aware of it, took out another patent. It was a strong argument against Hills, because Laming at that time had invented, and Hills did not satisfy the Attorney-General that it was his invention.

Portions of the evidence of Mr. Newton were then read.

Baron BRAMWELL: Was there any opposition to Mr. Hills' claim in 1848? I do not mean the patent in question, but the previous patent.

Mr. DENMAN: What I am saying is, that it is for us to show that undoubtedly Mr. Laming had in 1848 this invention upon his mind.

Baron BRAMWELL: It is clear from the evidence that Mr. Laming knew both parts of the plaintiff's process before the plaintiff took out his patent, and I should say, before the plaintiff even knew it himself.

Mr. DENMAN said that was true, and not only so, but he used it in September, 1848, in opposing Mr. Hills' patent. It was quite clear, therefore, either that he satisfied the Attorney-General that Hills had no right to any such invention as that, or that Hills' was a different process altogether.

Baron BRAMWELL: Surely you are now labouring at a point which you need give yourself no trouble about. Mr. Hills' patent of 1848 does not claim this.

Mr. DENMAN maintained that if it did not, it was owing to one of two reasons. But he wished to go further, and to make a remark respecting the deposit-paper. He considered that Mr. Hills' deposit-paper was that of a man who either did not know what the invention was, or else did not mean to claim the one in question; and to show that Mr. Laming's conduct and Mr. Laming's user in connexion with the other circumstances were a *bonâ fide* conduct and user—that of a person who had really invented the process in the first instance, and who really was endeavouring, by every practical expedient, to carry it into effect, and who intended, and did take out a patent for the things which were specified by him. He could not avoid troubling their lordships with one observation respecting Mr. Laming's user. Their lordships would remember that when the question of what Laming and Evans had done was first raised at the trial, there was a most unprofitable discussion respecting a model of the gas-works, which it was contended on the other side was an incorrect one, but which was afterwards proved to be correct. A great deal of time was wasted over that discussion, but it was not altogether immaterial to see how Mr. Hills could observe what was going on in the works. In fact, these experiments were the common talk of the yard, and Mr. Hills admitted he was there for two days.

Mr. GROVE: One day in September, and for half an hour.

Mr. DENMAN said the red oxide outside the purifier would be quite enough to indicate to him the nature of the experiments.

Baron WATSON: I thought this point was given up by Mr. Bovill.

Mr. DENMAN: As to Mr. Evans it was, but not as to Mr. Hills having learned it in the yard. He would now call attention to the knowledge which Mr. Hills derived from Mr. Laming's patent. Laming's invention was intended to purify gas from ammonia. It was impossible to say that the chloride of calcium was intended, as far as the invention was concerned, to purify from sulphuretted hydrogen. It was proved that the chloride entered into certain combinations in certain proportions. Under these circumstances Mr. Laming told the world that the oxides or carbonates (he used the word "carbonates" to a certain extent incorrectly) which resulted from these combinations were useful for the purification of gas. How were they useful? Not certainly by taking away the ammonia—that was done by the chloride of calcium—but they were useful for the purpose of taking out the sulphuretted hydrogen. That was the fact, although it was not stated in so many words. The learned counsel proceeded upon these data to argue at great length that Mr. Laming's patent precluded that of Mr. Hills, and cited cases in support of his argument. He then reviewed the specifications of Mr. Hills' patent in order to show that the invention was practically the same as that of Mr. Laming and Mr. Croll, and concluded an effective speech in the following terms:—"I venture to submit to your lordships that there are conclusive reasons to prove that the verdict has miscarried, and I trust your lordships will see that justice has not been done, and will therefore grant a new trial. As to the deliquescence upon which my learned friend laid so much stress, I have simply to say that at a time when the thermometer stood at 20°—a most unusual thing in this country—it was proved in evidence that Mr. Laming's substance did not answer. That was the evidence on that point. But on our side we proved that the muriate of magnesia, if it had been used under similar circumstances, would have produced precisely the same results. If our process, therefore, is bad in that respect, so is the plaintiff's. It was, however, a very exceptional case; and your lordships will not think that, because this failed in an experimental case, that there is any substantial difference between it and the other."

The LORD CHIEF BARON: The court will consider its judgment.

Miscellaneous News.

THE METROPOLITAN GAS SUPPLY.

MEETING OF THE DELEGATES.

A Meeting of the Delegates was held at the Court House, Marylebone, on Wednesday, the 23rd ult.—Dr. BACHHOFFNER, F.C.S., in the chair. The following delegates were present:—Dr. Bachhoffner and Mr. Hodge, Marylebone; Mr. Stevens, St. James's, Westminster; Mr. Dowden, St. George's, Hanover Square; Messrs. Stratton, Wood, Jeffree, and Assistant Vestry Clerk, Lambeth; Mr. Perry, Chelsea; Mr. Grant, Islington; Messrs. Godson and Clarke, Westminster District; Rev. J. Carlile, Woolwich; Mr. Gilbert, Kensington; Mr. Eldridge, St. Pancras; Mr. Holland, Newington; Mr. Lobjoit, Wandsworth; and Messrs. Beal and Hughes.

Mr. JAMES BEAL, the hon. secretary, read the heads of a bill, of which notice of application to Parliament has already been given. It provides for regulating the quality and illuminating power, the mode in which the pressure under which, and the price at which, the gas shall be supplied, and the terms and conditions of the supply; for regulating the voluntary and compulsory supply of gas and meters, and the amount and payment and recovery of gas-rents and meter-rents; for regulating the districts of the gas companies, and the limits within which gas shall be supplied; for regulating the laying, repairing, and altering of gas-pipes and works; for regulating the accounts of gas companies and providing for inspection, audit, and publication of accounts; for regulating the capital and borrowing powers of gas companies, and for limiting their profits and dividends and rates of interest, and for altering and reducing their respective rates; for regulating their powers with respect to contracts and transfer of their works; for conferring powers on the Home Office, Board of Trade, Metropolitan Board of Works, and other local bodies over gas companies; and to enable them to contract with the owners of gas-works, and to purchase works, enter into contracts, and to enable them to levy rates and borrow money for the purpose.

The CHAIRMAN drew attention to the three following clauses as being of a highly important character, and as being new additions to the bill:—

To enable the Metropolitan Board of Works, the corporation of the City of London, vestries, district boards of works, and other local authorities and public bodies and persons, to contract with the owners of any gas or other works already established, or which may hereafter be established, either within or without the said limits and City, for a supply of gas, or other luminating power, to the public and other lamps; and to enable such bodies and persons, or any of them, either jointly or separately, to purchase and acquire works and conveniences for such last-mentioned purposes, and to enter into contracts and agreements in relation thereto.

To enable such bodies or persons, or any of them, to levy rates and charges, and to borrow money by mortgage or otherwise, for all or any of the objects and purposes of the said Act, or to apply any money which may come to their hands under any other Act of Parliament to such purposes, and to levy rates or rents for supplying gas or other luminating power, and to create certain exemptions therefrom.

To enable such bodies or persons to break up streets, roads, pavements, and other highways, and to lay pipes through or under the same, and through and under each other lands and property, and to do all other acts and to exercise such other powers as may be necessary for effecting the whole or some of the objects of the said intended Act.

Mr. BEAL added that the great object had been to embody in the bill everything that gas reformers in the present day could desire.

The CHAIRMAN said he considered the last three clauses were very important. The desirability of having the proposed power had long been mooted by the vestries. The Metropolis Local Management Act gave the power to light the lamps, but not to raise the money. The proposed clause met this difficulty.

The report was then received.

Mr. BEAL intimated that Wednesday, the 30th instant, had been appointed by the President of the Board of Trade to receive a deputation of the delegates, who would assemble at St. Martin's Hall, at twelve o'clock.

It was proposed by Mr. JEFFREE, seconded by Mr. LOBJOIT, that Messrs. Beal, Hughes, and Dr. Bachhoffner, do head the deputation, and that the members for Marylebone, and the county members for Essex, Kent, Surrey, and Middlesex be invited to attend.

Mr. BEAL then read a petition to Parliament, intended to be circulated and signed by every gas consumer in the metropolis. It set forth that the gas companies had recently divided the metropolis into districts to be supplied by particular companies, the other companies withdrawing from such districts, and creating, in effect, a monopoly by destroying competition; and one of the principal evils of the monopoly of districting was that the consumers were placed at the mercy of the gas companies in respect of price, quality, and quantity. The petition suggested that the gas companies should be restricted by legislative enactments to a maximum charge, and be bound by a particular standard in the quality of the gas.

The petition having been approved of,

On the motion of Mr. DOWDEN, seconded by Mr. LOBJOIT, a committee of five was appointed to consider and report on the petition.

The next question discussed was the principle and preamble of the bill.

Mr. DOWDEN objected to the principle embodied in the bill of "districting." If they allowed the principle of districting to come into the bill the companies would be better pleased with it than anything else. He moved that all that part of the bill that tended to legalize districting be omitted.

Mr. HOLLAND observed that it was to oppose the principle of districting that they came there, and the gas companies themselves would pay very handsomely to get such a clause introduced.

After some observations from Mr. ELDRIDGE (St. Pancras), Mr. LOBJOIT (Wandsworth), Mr. STRATTON (Lambeth), and others,

Mr. BEAL said all they proposed by the bill was to place the districting under such regulations as should protect the public from monopoly, which would only grow into more gigantic proportions throughout the metropolis if steps were not taken to suppress it. If they must have "districting," it must be under proper restrictions; and if the proposed bill recognized districting, it was only in connexion with proper restrictions. If Mr. Dowden's resolution were carried, it would tend to neutralize the entire object of the bill. It was their duty to protect the public, and at the same time to keep the gas companies in a straight path.

Mr. GODSON thought that if they carried the proposed resolution, it would tend to demolish many of the provisions of the bill, and it was incompatible with the general provisions of the bill to raise the question at the present moment.

The CHAIRMAN decided that the resolution was incompatible with the principle of the bill, and that he could not entertain the proposition.

The proposition was accordingly withdrawn.

It was then resolved that a bill be submitted to counsel, with the alterations suggested by the parliamentary notice, and the "Sale of Gas Bill" be ready for the examiner of petitions and for the consideration of the delegates not later than Dec. 7.

The report of the finance committee showed a receipt of £1100, a payment of £372, and a balance in hand of £407.

It was then resolved that a report be drawn up with reference to the finances, and that application be made to the various parishes for their promised contributions.

On the motion of Mr. GODSON, it was resolved that each representative of the several vestries and district boards be requested to bring before their meetings a resolution to protect the interest of their district, and in connexion with any inquiry relative to the supply of gas in the metropolis in the ensuing session, with power to take all necessary steps, parliamentary or otherwise.

Mr. HUGHES then read the following report on the gas supply of the metropolis:—

The proposal to fix a maximum price for the whole metropolis of 4s. per 1000 feet for common gas, and 5s. for cannel gas, will necessarily require some strong support, because it contradicts so completely the views which have been advocated for some years by the gas companies and by that portion of the press which represents their interests.

There can be no doubt that the reduced prices are amply sufficient for densely-populated areas, such as the City of London, where the price of 4s. without meter-rents, has now prevailed for nearly ten years, and where it has been attended with a constantly increasing profit derived by the three companies supplying at this rate within the City.

The gas companies, however, argue that included in the extensive area of the metropolis there are large districts which are so little built upon, and which have a population so scattered, that much higher prices are necessary to enable the gas companies to pay a fair dividend.

It is believed that this difference between the urban and suburban parts of the metropolis has been much exaggerated, and that no sufficient reason exists for the high prices charged in parts of Lambeth, Wandsworth, and other suburban districts.

The Commercial Company affords the example of a large district thinly inhabited, and containing property much below the average value, and yet supplied at the lowest price—namely, 4s. per 1000—without meter-rents. Again, the Imperial Company, in its extensive range from east to west, through all the northern suburbs of the metropolis, supplies many a district containing as scanty a population as any within the metropolitan limits, and yet this great company charges nowhere a higher price than 4s. 6d. for common gas, and regularly pays a dividend nearly, if not quite, approaching 10 per cent.

In the face of these facts what justification can there be for charges varying from 5s. to 6s. for common gas in parts of Lambeth, Wandsworth, and Lewisham? The companies which charge these high prices are for the most part not confined to the thinly inhabited districts, but have also a share of the rich and well-paying area, so that they are not worse off than other companies, who are content with the uniform price of 4s. 6d., to say nothing of those which only charge 4s.

There can be no question that the price of 4s. would pay an ample dividend upon works laid out in the best manner, judiciously arranged for the most convenient supply of the metropolis, and constructed in all respects with a due regard to economy of capital. For instance, suppose that great scheme were carried out which was proposed some years since by a very celebrated gas engineer—to concentrate all the establishments for manufacturing gas in the metropolis at one spot on the river Thames, and use the present works only as distributing stations, retaining only the gasholders, and abolishing all works for actually manufacturing gas within the metropolis. The very accurate investigations which have been instituted into the prospects of this great scheme have shown that even a less price than 4s. would pay 10 per cent. on the capital required; and no doubt can exist that both on sanitary and pecuniary grounds the metropolis would be immensely benefited by carrying out this great idea, which is due to the late Mr. Clegg, a man who was probably more intimately acquainted with all the numerous details of gas-works and gas making than any of his contemporaries.

But if we proceed to examine upon any well-ascertained data whether this price will pay 10 per cent. upon the capital at present invested in metropolitan gas-works, arranged and conducted as at present, we are immediately struck on the threshold of the inquiry with an anomaly which throws great doubt on the probability of any such result. This anomaly is the remarkable and enormous difference in the capital on which interest has to be paid by one company as compared with another.

Probably one of the best modes of comparing capital accounts is to calculate the amount of capital which is represented by every £100 of annual gas rental. This mode was suggested about two years ago by the conductor of a journal in the interest of the gas companies, and who, though frequently very wild and inconsistent in his statements, has still a very competent knowledge of gas matters, and who would really be of immense service to his patrons and clients if he would apply his knowledge to correct and expose their errors, instead of defending and supporting them. To let this pass, however, the mode of comparison proposed is that of considering what amount of capital is invested by each company for every £100 which they receive as gas rental. A comparison of this kind shows that the following amounts of capital were invested by each company for every £100 of rental received in the year 1857:—

	Capital represented by £100 of gas rental.
South Metropolitan	£243
Chartered	337
Commercial	398
Surrey Consumers'	401
Phœnix	416
Great Central	425
Equitable	427
Ratcliff	439
Western	459
City of London	465
London	583
Imperial	—

A glance at these figures is sufficient to show, for example, that the same price which would bring the South Metropolitan 10 per cent. would only pay the London Company 4 per cent., so monstrously disproportionate is the capital of the latter.

Even taking two old companies, such as the Chartered and the London, the proportion of capital invested is much in favour of the former. The Chartered Company supplies gas in the City of London at 4s. per 1000, without meter-rent, and if its rental be adjusted to correspond with the price charged by the London Company, the capital employed by the Chartered will be £307 for each £100 of rental. Hence a price which would pay 10 per cent. on the capital of the Chartered Company would pay only a little more than 5 per cent. on that of the London Company.

Of course all this may be put in the opposite or inverted form, by which it would appear that a price for gas which would pay 10 per cent. on the capital of the London Company would pay enormous and utterly extravagant dividends on those where the capital is moderate and confined within reasonable limits.

Enough has probably been said to show, however, that it is hopeless to expect any fixed price of gas to pay an equal rate of dividend to all the companies supplying the metropolis.

We may also draw another inference from the preceding figures, namely, that the conditions which the gas companies have themselves created, especially in reference to the outlay of their capital, are such as to affect their dividends far more seriously than the extreme range of prices ever proposed to be charged for gas at any one time in the metropolis, and also more than any of the differences in price, large as these are, which now exist for the supply of the same quality of gas in various parts of the metropolis.

On the Financial Position of the present Gas Companies supplying the Metropolis.

Under this head I propose to give a brief summary of some important facts derived from a very accurate and laborious examination of the companies' accounts during the last five years—namely, from 1854 to 1858 inclusive.

The companies which will be comprised in this statement are the following:—The Chartered, City of London, Equitable, London, Phœnix, South Metropolitan, and Western, these being the only seven of the companies supplying the metropolis whose accounts are accessible and complete, or nearly so.

I have compared the rental, expenses, profit, and other branches of accounts, year after year, with the sum expended for coals, and this comparison I conceive furnishes a proper and strict criterion whereby to judge of the prosperity of the company.

The business of gas-making consists in the manufacture of certain saleable articles, as gas, coke, tar, &c., out of a raw material, namely, coal, and it may be considered a safe mode of testing the success of the manufacture to compare the receipts, expenses, &c., with the outlay required in the first instance to be expended in the purchase of the raw material.

The standard which I have adopted for these comparisons is, in each case, £100 worth of the coal or raw material. By way of illustration, supposing the rental derived annually for every £100 is regularly and constantly increasing, while, at the same time, the expenses are fixed, or nearly so, it clearly follows that the profit must also be regularly increasing, and this inference is directly corroborated by similarly comparing the profits with the cost of raw material, when the profits are found to increase in a similar ratio.

Rental of Gas Companies.

Under this head is comprised the whole rental derived from sale of gas and hire of meters.

1. The Chartered Company in 1854 realized £159 from these sources for every £100 which they expended in coal. Since the year 1854 the receipts have gradually increased till, in 1858, they amounted to £200, showing an increase of £41 for every £100 expended in coal.

2. The City of London Company, which charges no meter-rent, received from the sale of gas alone £171 for each £100 expended in coal, and in 1858 the receipts had increased to £214.

3. The Equitable Company had a rental in 1854 equal to £200 per cent. on the cost of coal, and this had increased in 1858 to £233 per cent.

4. The London Company realized a rental in 1854 equal to £155 per cent. on the cost of coal, and this had increased in 1858 to £218 per cent.

5. The Phœnix Company in the same quinquennial period increased its rental from £153 per cent. to £238.

6. The South Metropolitan, from 1855 to 1858 inclusive, increased its rental from £184 per cent. to £258 per cent.

7. The Western Company in the five years commencing with 1854 increased its rental from £201 per cent. up to £221.

Taking the average of the whole seven companies, it appears that in 1854 they derived a rental of less than £176 for each £100 expended in coal, and that in 1858 this rental had increased to more than £226, being an addition of nearly 30 per cent.

Let me pause for a moment to examine this a little more closely. This increase, it will be observed, is entirely independent of that regular and progressive addition of income which all gas companies realize from the legitimate extension of their trade, owing to the increase of consumers and the increase of consumption by the old consumers. This is an increase of revenue arising with the same absolute annual expenditure in the purchase of raw material. In other words, the gas companies are working their raw material to such advantage, that in five years they increase the produce from it to the extent of 30 per cent. This result, realized on the largest scale, not by one company alone, but by all those supplying the metropolis (because the seven which have been examined may well be taken to represent the whole), is one so remarkable that the manufacturing industry of the country offers few examples of a similar kind.

The question will naturally arise, to what is this unexampled prosperity due, how has it been effected, how have the companies managed it? I propose to return on a future occasion to the consideration of this question.

Income from Residual Products.

The receipts realized from the sale of coke, tar, grease, and other residual products, have been nearly stationary on the average of the last five years. Thus, in 1854, the amount realized by the seven companies which have been mentioned was equal to 49 per cent. on the cost of coal, while the average amount realized by the same companies in 1858 was 49·5 per cent., or only 10s. per cent. more,—a trifling difference, which of course can in no way account for the very large increase both of rental and profit.

All other Expenses of Gas-making, exclusive of the Cost of Raw Material.

A very instructive series of calculations has been made to determine this point, the general result of which may be stated as follows:—The average cost of gas-making, exclusive of coals, in 1854, for the whole seven companies, amounted to 82¼ per cent. on the cost of coal; while in 1858 these expenses, according to the accounts, had increased nearly to 105 per cent. If it were not for this increase, the profits, which will be given presently, would of course have been much larger; and therefore it may be necessary to examine for a moment why these expenses appear to have increased. An accurate investigation of the accounts has shown that the increase is principally due to much larger reserves being put aside to cover depreciation of works, and probably in some cases to actual renewals which have taken place. In the case of one company especially, the South Metropolitan, which exhibits an increase in these expenses from 87 per cent. in 1855 to 152 per cent. in 1858, there can be no doubt that a large proportion of this increase has been caused by actual works of construction, such as extension of mains, &c., being charged to revenue instead of capital. It follows from this consideration that the large dividends paid by this company would be much larger still had they not adopted the practice of keeping their capital stationary, and actually constructing a considerable part of the works out of revenue. The causes which have been stated are amply sufficient to account for the apparent increase of expense as set forth in the accounts of the companies.

Total Cost of Gas-making per £100 of Coal, including Purchase of Raw Material and every other Expense, after deducting the Sale of Residual Products.

It will be anticipated, from the investigation which has been described in the previous section of this inquiry, that the absolute cost of gas-making has been increasing during the last five years, and the reasons which were there given for the increase of the expenses there treated of will also apply to the increase of the whole expenses, which we are now considering.

1. In the case of the Chartered Company, the whole cost of gas-making was 132 per cent. on the cost of coal in 1854, and these expenses in 1858 had increased to 147 per cent.
2. In the City of London Company the expenses in 1855 were 138 per cent., and in 1858 they were nearly 152.
3. The Equitable expenses increased from 129 per cent. in 1854, to 165 per cent. in 1858.
4. The London in the same period increased from 129 per cent. to 155 per cent.
5. The Phœnix, from 119½ to 163 per cent.
6. The Western Company fell from 157 per cent. in 1854 to 153 per cent in 1858.
7. The South Metropolitan increased from 130 per cent. in 1855 to 170 per cent. in 1858.

Lastly, the average increase for the whole of the companies has been from 133 per cent. in 1854 to 158 per cent. in 1858.

Absolute Profits.

This is the touchstone of the whole matter, and this part of the inquiry possesses peculiar interest at the present time, when a general opinion is gaining ground that the prices now charged for gas throughout the greater part of the metropolis are considerably higher than they ought to be. The results brought out by this inquiry undoubtedly confirm the idea that the gas companies as a whole are annually increasing their profits, as will be more clearly seen from a perusal of the following facts:—

1. The Chartered Company made a profit in 1854 equal to £27 on every £100 expended in coal, and this profit had increased in 1858 to 53 per cent., or nearly double.
2. The profit of the City of London Company increased from 33 per cent. in 1855 to 63 per cent. in 1858.
3. The profit of the Equitable in 1854 seems from the accounts to have been rather more in 1854 than in 1858, but increased from 37 per cent. in 1855 to 67 per cent. in 1858.
4. The profit of the London Company increased from 26 per cent. in 1854 to 63 per cent. in 1858.
5. In the same period the profit of the Phœnix increased from 33 to 74½ per cent.
6. In the same period the profit of the Western increased from 44 to 68 per cent.
7. In the South Metropolitan the profit increased from 54 per cent. in 1855 to 88 per cent. in 1858.

Finally, the working of the whole of these companies shows an average profit in 1854 equal to 41 per cent., and this average profit had increased in 1858 to 68 per cent.

The most important inference to be drawn from all the preceding facts is probably this, that in spite of increased expenses, the profit of the gas companies is gradually becoming higher and higher year after year. A distinction must be drawn here between the expenses of manufacturing a given quantity of gas, and expenses of converting a given quantity or value of raw material into gas. It is the latter which has increased, not the former. On the contrary, it is probable, nay, certain, that the expenses of manufacturing gas by the 1000 feet are really diminishing, and hence one reason for the increased rental and increased profits which the companies are deriving.

It would exceed the limits of this paper to enter into the causes of this regular increase both of rental and profit. Should the delegates think it material to the public interests to prosecute this part of the inquiry still further, I shall be happy to enter into it on a future occasion.

At the present moment, the chief practical inference to which I would call attention, as arising from the preceding examination, relates to the effect which the recently proposed reductions of price to 4s. and 5s. will have on the profits of the companies.

The average rental of the companies in 1858, as already explained, was £226 for every £100 expended in coal.

Considering that a large quantity of gas is now supplied in the metropolis at the proposed price of 4s., and that consequently the companies supplying at this price are not expected to make any further reduction, it is probable this will more than balance the reduction of 1s. per 1000 in the price of cannel gas, so that it will be about reasonable to assume that the proposed reductions will affect the whole gas rental of the metropolis to the extent of one-ninth part, and hence the following calculation:—

	Per Cent.
Average rental in 1858	£226
Proposed reduction to 4s. and 5s., equal to 1-9th of the above	25
Leaving reduced rental	201
Less all expenses in 1858	159
Leaving profit	42

Or something more than the average profit derived in 1854.

But if the expenses are calculated at the same amount as in 1854, there will remain a profit of 71 per cent. on the cost of the coal, which, notwithstanding the reduced prices, will pay higher dividends than at present.

Throughout this paper I have endeavoured rather to bring forward facts than to draw inferences from them. I believe the facts are indisputable, as they are all based on the companies' own accounts. An important subject of this nature furnishes, of course, a very wide field for reflection, and the same facts may not suggest the same inferences to all minds.

My present object will be attained, however, if I have laid open in some degree the financial position of the gas companies supplying the metropolis, and furnished some data for sound legislation in the ensuing session.

Thanks were given to Mr. Hughes for his valuable paper, which was ordered to be printed and circulated; and thanks having likewise been awarded to the chairman for his ability in presiding, the delegates adjourned.

DEPUTATION TO THE PRESIDENT OF THE BOARD OF TRADE.

On Wednesday a deputation, consisting of delegates from the metropolitan parishes and several of the representatives of metropolitan constituencies, met together for the purpose of laying before the President of the Board of Trade the position in which the public was placed in consequence of the gas monopoly, and of urging the expediency of some steps being taken by the Government to remedy the evil complained of. The following were present:—From St. James's, Westminster, Messrs. Foxley, Stevens, Beal, and Chinnock; from Marylebone, Mr. Wingfield and Dr. Bachhoffner; from St. Olave's, Southwark, Messrs. Fox, Langley, and Walker; from St. Pancras, Messrs. Farrar and Cameron; from St. George's, Hanover Square, Messrs. Dowden and F. R. Bertolacci; from St. Mary's, Newington, Messrs. Holland, Redfern, and Price; from St. Luke's, Chelsea, Messrs. Perry, Watkins, and Lahee; from Woolwich, Rev. Mr. Carlile; from St. Mary's, Islington, Messrs. Elt, James, Grant, and Layton; from Westminster district, Messrs. Godson and Clarke; from St. Martin's-in-the-Fields, Messrs. Marshall and Dangerfield; from Kennington, Messrs. Gilbert and Wilkins; from St. Giles's, Mr. Waring; from the Strand district, Mr. Lewis; from Wandsworth, Messrs. Tolcher, Lobjoit, and Jackson; and from Lambeth, Messrs. Jeffree and Warren; with Mr. Wyatt, parliamentary agent; Mr. Beal, honorary secretary; and Mr. Hughes, honorary engineer; Sir James Duke and Sir John Shelley.

At the preliminary meeting, held at St. Martin's Vestry,

Dr. CARLILE said that there were two companies in Woolwich, enjoying under their private Act the monopoly of the gas supply, and he wished to know whether, in the event of the bill prepared by the delegates passing, there would be power to introduce a new company?

Dr. BACHHOFFNER said there was nothing in the bill which would prevent the introduction into Woolwich of a new gas company, entirely independent of those at present in existence.

Dr. CARLILE suggested that this movement on the part of the vestries should be more extensively agitated through the press, and by public meetings held in different districts.

Mr. BEAL said, as regarded the press, the *Daily News*, the *Morning Chronicle*, and the *Morning Advertiser*, had given them very masterly leaders. The *Star* and the *Standard* had given full reports of their meetings, and the *Times* had been brought at length to give them support. As regarded the other suggestion, he had agreed to attend two public meetings in Chelsea next Tuesday night, and one in the following week at Stoke Newington, to explain the object of the movement, and he should be glad if similar efforts were made elsewhere.

The meeting then adjourned, and the delegates proceeded to the offices of the Board of Trade, where they were received by Mr. MILNER GIBSON, the President of the Board.

Sir J. SHELLEY, who introduced the deputation, said, in illustration of the interest that was taken in this matter throughout the metropolis, that twenty-five out of thirty-three parishes had contributed towards this movement, and those who had not done so were supplied with gas at the rate at which the bill proposed to supply it. A committee of the House of Commons had sat on this subject last session, and he could not help observing that the constitution of that committee was one of the most unfortunate. (Hear, hear.) That committee was divided into two, one half of the members representing the metropolitan constituencies, and the other half being gentlemen who were deeply interested in the gas companies; so that it was not likely the committee would arrive at a satisfactory result. The first difficulty that arose was from the fact of the unfortunate position in which the metropolis was placed from a want of the possession of corporate powers to enable them to raise money to pay counsel, and for the purpose of bringing these matters before Parliament and defraying the necessary expenses consequent on such a movement; a difficulty that did not exist in the case of the wealthy gas companies. An inquiry did, however, to some extent take place, but the committee decided that, as Parliament would soon be prorogued, it had better be closed altogether; so that at present the case had been very ineffectually brought before Parliament. The principal object of the deputation was to impress upon Government that this was really a case that the Government ought to take up. Gas was now one of the most essential requisites of life, and presented a parallel case to that of water, and when the question of the water supply of the metropolis was brought before Parliament, Mr. Edwin James, the eminent Queen's counsel and M.P. for Marylebone, laid great stress upon the fact that the great object of the Government in bringing in the bill was entirely a public one, that of giving the inhabitants of the metropolis a better supply of water and at a cheaper rate, and at a more uniform price to the poorer classes. (Hear, hear.) The same argument applied exactly to the case of gas, for he believed that the case could not fairly and properly be brought before the House unless it was taken up by Government, and that it would be hopeless to attempt to do justice to the metropolis unless Government gave them municipal powers to raise the money, as was the case in provincial corporate towns, so as to protect their interests and their rights.

Mr. J. LOCKE, M.P. for Southwark, thought the Government would not find the subject so difficult to deal with as might be imagined, even as regarded the price of the supply. In the committee Sir J. Shelley and himself appeared on the part of the gas consumers, and Sir W. Hayter and Mr. Russell for the companies. Probably each side might have thought that the other sought to obtain too much, and they were pretty nearly unanimous on most minor points, as regarded legislation, until they came to the knotty point of the illuminating power that should be produced for a particular amount. (Hear, hear.) On that they could not agree, and it was just upon that particular point that the consumers of the metropolis called upon the Board of Trade to interfere, and determine what ought to be the maximum price charged for an argand burner of the power of 12 sperm candles. In fact, in considering the subject of the supply of 1000 cubic feet of gas for 4s. 6d., they split upon the difference between 12 sperm candles and 12 wax candles. (Laughter.) In other words, the difference between them was 1s. 6d., and the maximum price of 6s., which the companies insisted upon, was much too large. Then there was another point on which they differed. The companies were anxious that there should be an appeal to the Board of Trade in the event of the expense of producing the gas being increased, and that they might be entitled to raise the price upon the Board of Trade giving them sanction. They said it was all very well, but they knew that years ago gas was as high as 16s. (Sir JAMES DUKE: 16s. 9d.) Since then the City Company had reduced it to 4s., without meter-rents, at a profit. In Southwark it was reduced to 4s., and it was only when the companies were amalgamated and created a monopoly that the price was raised. What they wanted was, that if hereafter science enabled them to show that gas could be supplied at a lower rate than at present, the vestries should have the oppor-

tunity equally with the companies of coming to the Board of Trade. As representing the consumers of Southwark, he felt it was impossible that the vestries should arrange the matter, and they called on the Government to do it.

Mr. E. JAMES, M.P. for Marylebone, referred to the direct analogy, in a public point of view, that existed between this case of the gas supply and that of water. In the case of the water supply the Government did not like a number of companies supplying water at different rates, and thought there should be a general arrangement in the matter. The Government took up the question, and after a few days the unanimity of all parties became perfectly wonderful; and if the gas companies would do as the water companies had, it would be to their interest to have some similar general provision. Indeed, there was a direct analogy between them. Sir Cornewall Lewis, on the occasion in question, represented the Government. If the gas companies only did as the water companies, it would no longer be to their interests to resist a fair and equitable measure for the public supply, and he trusted that if this should result, his own constituency would be as much benefited and enlightened as those of the metropolis in general.

Dr. BACHHOFFNER said the extensive parish of Marylebone, which he represented, paying a gas rental of £12,000 per annum, was decidedly opposed to the existing state of things. The districting system was undertaken without their consent, and the companies had lotted out the metropolis generally on that system; and in the district he represented the system both of price and supply consequent on this was carried out on the most arbitrary and capricious principle.

Mr. BEAL observed that they came before the Board of Trade as the protectors of the trading public. Unfortunately they had not the means of raising, except by subscription, the money power to fight the companies, and it was therefore of the highest importance that Government, in the interests of the public, should take the matter up. The only remedy for the wished-for reformation was in the combined action of the metropolitan vestries, and what they asked Government to do was to introduce restrictions on the metropolitan gas companies similar to those imposed on the provincial, and which during the last three years had formed the basis in legislating for the latter. It was perfectly within the province of the Board of Trade to place the companies as well as the consumer on an honourable basis, and to arbitrate the matter on the equitable interests of both.

Mr. HUGHES, C.E., pointed out to the president some of the anomalies that existed both in the price and quality of gas at the present moment. The price, though of the same quality, ranged at from 4s. to 6s., but there was a great difference in the illuminating quality. The common gas varied from nine to thirteen sperm candles, while the illuminating power of the cannel coal varied from eighteen to twenty-five and twenty-six, making a difference of 33 per cent. to the consumer. There was no control at present over the metropolitan companies with respect to the quality of the gas, whereas in the Acts of provincial companies it was properly defined.

Sir J. DUKE, M.P. for the City of London, avowed that, although a director of a small gas company, he nevertheless admitted that Mr. Beal had stated the case most fairly, and he should be happy to assist in any reasonable compromise. Reference had been made to the high price of gas in former days, but the cost of coal should be borne in mind, and the companies had gone on reducing the price of gas as the price of coals had fallen. (Hear, hear.) The late Sir Robert Peel, that practical statesman, and Sir William Congreve had introduced and insisted on "the districting" system; seeing that, if it were not adopted, no end of money would be expended by the companies in contesting, and that the public would have to pay for it in enhanced prices for supply. He did not think that any company had raised the price of gas since the districting system was introduced. (Several VOICES: "Oh yes; the Chartered, the Equitable, and the Western.") They had been coming down from 16s. to 4s., but going down to 2s. would hardly do. There was a great difference between gas and water companies. Water was not a manufactured article. During the Russian war coals rose 5s. per ton, but the public were not deprived of cheap gas.

Mr. WALKER, of St. Olave's, Southwark, said that since the districting system had been introduced, 15s. per lamp had been added—a strong illustration of the pernicious nature of the system.

The PRESIDENT OF THE BOARD OF TRADE said he thought the deputation had very fully and clearly stated the case on the part of the consumers, but as the greater question, that of the consumers on the one hand and the gas companies on the other, had not been gone into, as he had heard no representatives on the part of the companies, he felt himself precluded from offering any opinion on the merits of the controversy between the parties. He had heard enough, however, to convince him of the importance of the question—(hear, hear)—and it would, of course, be the duty of the department to consider, first, whether the Government through that department should interfere in the matter; and secondly, should there be any interference at all, what course, as to the particular measure to be proposed and passed, should be determined on and adopted. To that question he would give full consideration, although he was not exactly clear as to whether it was a question that came properly within the jurisdiction of the Board of Trade, and whether, indeed, it did not more properly come within the province of the Home Office. That, however, would be a matter for consideration, and the entire subject should receive immediate attention. (Applause.)

The deputation then withdrew.

DEPUTATION TO THE HOME SECRETARY.

A Deputation, similarly constituted to that which on Wednesday waited upon the President of the Board of Trade, attended on Thursday upon Sir George Cornewall Lewis, at the Home Office, to explain their views, and to urge upon the right hon. gentleman the necessity for Government interference between the gas companies and the consumers. The attendance of delegates was not so numerous as on the previous day, and of the metropolitan members Sir John Shelley, Mr. John Locke, and Mr. Roupell only were present.

Sir J. SHELLEY opened the proceedings by recapitulating the various points which he brought under the notice of Mr. Milner Gibson, and drawing particular attention to the fact that the vestries were not fairly placed in a contest with the companies before Parliament, from their not having power to raise funds for the support of their claims. He alluded, in the course of his remarks, to the small attendance of delegates on that occasion, which he attributed to insufficient notice and the sitting of several of the vestries at the time appointed for the interview.

Sir G. LEWIS asked if there was no limit in regard to price in the Gas Companies' Acts.

Sir J. SHELLEY said in some cases there was a limit, but price was one thing and quality another. The public wanted security for the illuminating power they paid for, and this they were deprived of by the union of the companies.

Sir G. LEWIS: Your argument is that the only security the public had was the competition of companies, and that that has been removed by the agreement.

Sir J. SHELLEY: Yes; and that the Acts of the companies were granted by Parliament in the knowledge that the interests of the public were secured by competition.

Sir G. LEWIS, referring to the unfavourable position which the consumers had occupied before committees arising from want of funds to conduct their case, inquired whether the expenses of witnesses were not paid by the House.

Mr. BEAL said that advantage was refused them, and each party had to pay its own expenses.

Sir J. SHELLEY proceeded to detail the cause of the failure of the last committee which sat upon the subject, and called upon the Government to interfere in this case for the protection of the consumer, as they had done in the analogous case of the water supply.

Sir G. LEWIS remarked that in the case of the water companies the Government proceeded on the report of a committee. They did not act till there had been full inquiry and a recommendation; whereas in this case they had no report upon which to found legislation.

Sir J. SHELLEY admitted this distinction, but added that in the case of the water supply the Government paid the expenses of the consumers.

Sir G. LEWIS: In this case there has been an inquiry which has led to no result.

Sir J. SHELLEY: The reason was that Parliament was dissolved, and we were stopped in the middle of the examination of a witness.

Mr. LOCKE considered that the difficulties of the case had been removed in a great measure by the proceedings before the committee. A sub-committee was appointed, consisting of gentlemen on both sides of the question, who went through and agreed upon nearly all the clauses, differing only as to the illuminating power that should be supplied for a particular price. It was necessary that this should be defined, because the consumers thought themselves entitled to be supplied at a cheaper rate in consequence of the saving in expense to the companies from districting, while the result of the arrangement had been to increase the price. The companies once attempted to pass through Parliament a private bill to legalize districting, but it was lost through the efforts of Mr. Williams. The consumers did not deny that districting might be beneficial, but they claimed for their protection that if the principle were legalized the price of gas ought to be fixed.

Sir G. LEWIS: It follows as a necessary consequence that if you give up the principle of competition you must fix a maximum. (Hear, hear.) Do the companies dispute the principle or the amount?

Mr. LOCKE said that they disputed the amount, but they also claimed for themselves an appeal to the Board of Trade to increase the price with the increase in cost of manufacture, while they denied the right of a counter appeal to the Board of Trade to the consumers. These were the only points which he thought presented the slightest difficulty, and if the Government would take up the question he believed they would be able, with the greatest facility, to propose an arrangement satisfactory to both parties.

Sir J. SHELLEY said that it really was most important the Government should take up the question, seeing the disadvantage under which the consumers laboured. The gas companies would not come to Parliament because they knew that Parliament would insist upon reference as to the quality of the supply, and so long as they stayed away they defied the public. The consumers were only anxious for an arrangement just to both parties, and he sincerely believed that if the Government took the matter in hand the difficulties would vanish at once.

Sir G. LEWIS observed that the difference of position between London and other corporate towns, in a matter of this nature, arose solely from the enormous size of the metropolis, which had been described as a province covered with houses. The interests were so multifarious and the people composing the town lived at such distances from one another, that when a question of this kind was raised, the difficulties to be met were much greater than would have to be encountered in a similar case, even in Liverpool or Manchester.

Sir J. SHELLEY remarked that the companies objected to have their quality of gas tested by disinterested persons, and there was not a meter that could not be made to register 20, 30, and 40 per cent. against the consumer.

Sir G. LEWIS said an Act was passed last session to correct that.

Mr. ROUPELL argued that as the difficulties of the case were great in consequence of the size of London, the necessities of the case were also great, and this was a reason for Government directing attention to the matter.

Mr. BEAL explained the provisions of the bill prepared by the committee of delegates, and suggested that the details should be decided upon by gentlemen representing both the companies and the consumers, and that the question of price and quality should be left to a committee of the House of Commons. If the consumers were in a position to meet the companies upon an equal footing, they would not intrude upon the Government, but while the parliamentary expenses of the companies in this matter had exceeded £6000, the subscriptions on the other side, extending over two years and a half, had not exceeded £700.

In reply to Sir George Lewis,

Sir J. SHELLEY stated what took place at the Board of Trade, observing that the impression conveyed by Mr. M. Gibson was that the claim of the consumers was no more than reasonable, if they could prove their case.

Sir G. LEWIS said the great difficulty in dealing with the question, as it appeared to him, did not so much arise from the legal or scientific aspects of the case as from the number of conflicting interests that were brought to bear upon it. The small provincial towns were supplied by one company; and, as regarded London, the real difficulty did not arise so much from the state of the law as from the enormous magnitude of the districts over which the gas supply extended. London had been graphically described as a province covered with houses. Its interests were multifarious beyond comparison, and when they came to consider a subject of this sort the difficulties that surrounded it were very different in their scale and character to those either of Liverpool, Manchester, or any other extensive town in the kingdom. He had no reason whatever to doubt that the deputation had stated their case fairly, but it would be impossible for him to form a judgment on their statement until he had heard both sides. They had stated the case with great clearness, and he had been enabled to understand distinctly what the position of the question was. With regard to companies he thought all experience had shown that where companies with a large capital and plant come into competition one with another, that that competition on its becoming operative and active was generally of a ruinous nature. That was the first effect of the competition of companies. One tried to destroy another. It was not the sort of competition that existed in retail trades, where competition was of a wholesome and tolerable character, but it was generally directed to the attempt on the part of one company to destroy and ruin another. They generally went on for a time until the effect was partially produced, and then it oftentimes resulted in a compromise. They

agreed to divide the district on certain terms, and the necessary result was a monopoly. That had been approved by the Legislature, and in many cases an attempt had been made to fix the maximum price, as on railways. The Legislature did not trust to the influence of competition to secure the public against extravagant charges in travelling; but wherever there was a price fixed by Act of Parliament, unless it were a maximum or high price, there was always danger of inconvenience being produced. As regarded the price of public carriages in London, the fares of cabs were fixed by Act of Parliament. It happened during the Crimean war that the price of forage became very high, and there was great difficulty in maintaining the scale, but now that the price was lowered we saw the result. If the principle of competition was abandoned in connexion with the supply of gas to the metropolis, the only protection he apprehended to the consumer must arise from some definition of the price by Act of Parliament. That might be done in some manner, and there might also be superadded the additional safety-valve of the power on the part of the Board of Trade either to raise, revise, modify, or reduce the price as circumstances might require. Looking at the precedent of the water companies and the Water Supply Act, and the difficulties that existed in the metropolis with regard to any general measure in the absence of any one municipal authority, there would be a *primâ facie* ground for the Government to consider the question as to whether they should take it in hand; though with respect to the two cases of gas and water there was manifestly a difference, in that in the latter case there had been a full and formal inquiry by the House of Commons into the grievances complained of and the remedies required, while, in the former, there had been scarcely any inquiry, and it did not appear at present that there was any conclusive evidence with regard to the grievances complained of beyond the statements that had been made. With regard to the water supply,—how were the rates fixed? Was there a general rate for the whole metropolis, or were there separate rates for each company?

Mr. BEAL said that there were separate rates.

Sir G. LEWIS thought that it would greatly complicate the matter if separate rates were to be fixed for the different gas companies.

Mr. HUGHES said that in the water case the rates were in a great degree made dependent upon the distance which the water was brought. There would be no necessity for such a distinction in the case of gas.

Sir G. LEWIS remarked that before the Water Act was passed there had been a preliminary inquiry before a committee and a report to the House. Had the present deputation any proof of the existence of a grievance? He did not for a moment doubt the accuracy of the statements which had been made; but if the Government took the matter in hand they must proceed upon authentic evidence.

Mr. LOCKE referred to the evidence taken before the committees of 1858 and 1859, and contended, that although not complete, it made out an ample case for the interference of the Government.

Sir J. SHELLEY said that if the movers in the present matter had funds they could lay a complete case before the Government.

Mr. BEAL observed that the companies were a rich and powerful body. They had expended about £6000 in resisting the measures of the parishes, while the parishes in two years and a half had not expended more than £700, the greater portion of that being in printing. He had satisfactory evidence to show that for the public lighting alone the companies exacted £50,000 a year more from the parishes than in justice they were entitled to.

Mr. WYATT (parliamentary agent) said that though he was not prepared to give any official intimation of the fact, he believed that the companies were willing to discuss the question, and even to concede that some legislation was necessary. This was almost tantamount to agreeing to the preamble of the bill.

Sir G. LEWIS asked if the delegates had had any communication with the Metropolitan Board of Works?

Mr. BEAL replied they had, but the board had no jurisdiction. They approved, however, of the bill.

Sir J. SHELLEY thought it need only go forth authoritatively that the Government intended to take the matter up mediatorially as between the companies and the consumers, to secure what was required for the public interest.

Sir G. LEWIS said that he had already been requested by the representatives of the gas companies to receive a deputation. He should now communicate with them, and when he had heard their views he should be better able to state what course the Government would take. He would also communicate with the President of the Board of Trade on the subject.

The deputation, who appeared highly gratified with the result of their interview, which lasted nearly an hour and a half, then thanked Sir George for the courtesy with which he had received them, and withdrew.

THE GAS QUESTION IN MANCHESTER.

The following correspondence between the ex-chairman of the Manchester Gas Committee and the chairman of the Gas Consumers' Association has appeared in the columns of the *Manchester Examiner and Times*.

"*To the Editor of the Examiner and Times.*

"Sir,—Some person has been good enough to send me, through the post, a copy of your paper of yesterday, containing a letter from Mr. Falkner, chairman of the Gas Consumers' Association, under the head of 'Gas Mismanagement,' and evidently written for the purpose of showing what that gentleman calls the 'disgraceful mismanagement of the gas-works,' and asserting that 'the all dominant mind of one person has produced these evils.' By this 'one person' I presume, from the frequent mention of my name, Mr. Falkner means me. I shall not condescend to comments on the decency of such a reference to me, personally, in connexion with a charge to which Mr. Falkner has attached the epithet 'disgraceful.' Of my long connexion with the Manchester Gas-Works I shall ever feel proud. The value of that connexion in promoting the extension and improvement of the great establishment concerned, and of rendering it in the highest degree efficient as the source of vast social benefits to the community at large, has been acknowledged, by those who have had opportunities of forming a judgment, in terms which enable me to endure the censures which Mr. Falkner thinks it becoming, though evidently ignorant or unscrupulous, or both, on the subjects, to utter. With him, therefore, it is not my attention to continue a controversy. One of the gross misrepresentations made by this gentleman, I have already exposed; and, since then, in consequence, there are no longer daily advertisements to mislead the public, stating the price of Manchester gas at 5*s.* and of Liverpool at 3*s.* 9*d.* In the letter of Mr. Falkner, to which I am now referring, that gentleman gives a comparative statement of the condition of the Manchester Gas-Works in 1847 and 1858. And on this statement he makes the following comments:—

"'Here are double capital, double the quantity of gas produced, nearly three times the number of customers, 250 miles of mains as against 109, and yet the result, the profit, is £8000 less than 1847.'

"Now, to understand the candour and truth of this statement, it is necessary to explain that the Manchester Gas-Works from their commencement have been without what is strictly denominated 'capital.' They were created by money borrowed; their foundation was not capital, but credit. This condition has continued from the beginning; and extensions, it may be said, from nothing to their present magnitude, have been produced by increased borrowing. On money thus raised interest has to be paid, which now amounts to a large sum. Besides this great charge, there are other charges for obligations which the Town Council has, from time to time, imposed upon the gas-works,—such, for instance, as the Market Street improvement debt, which was originally charged on the highway rate. These charges, which would have no existence in any establishment that was founded and traded on real capital, are of course, in the case of the Manchester Gas-Works, a part of the profits, and would be so dealt with where the only object was to state the truth. It seems, however, better to suit the purposes of Mr. Falkner to keep out of sight these facts, and speak of the surplus which remains after paying the above charges, as being the whole of the profits, and not, as it clearly is, merely a part of them. What, then, becomes of his assertion that the profit, with 'double capital,' when there is in point of fact no capital, 'is £8000 less in 1858 than in 1847.' I am writing this at home, where I have not exact figures and accounts to refer to, and, therefore, cannot say what is the comparison between the profits of '1858 and 1847.' But, when I became a member of the gas committee, in 1840, the profits, at a price of 7*s.* per 1000 feet (as shown in the way I have explained), were about £30,000; and in the year ending in June last, at a range of from 4*s.* to 5*s.* per 1000 feet, were more than £60,000; and this, if the price of 1840 had been maintained, would have considerably exceeded £100,000! Your readers, I hope, will compare this with the statements and comments recklessly made by Mr. Falkner.

"Mr. Falkner, it appears, has been reading my speeches in the council on the subject. I believe, therefore, he must have seen, in those speeches, that I have frequently told the council that, for the price of gas, the gas committee were not responsible—that the price rested with the council, and the council alone. It is probable, too, that he may have seen that I have opposed certain appropriations of the gas profits to what he calls the 'two sucking children of the gas-works,' and that I have done so because such appropriations interfere with reductions in the price of gas.

"What pretence, then, has this gentleman for insinuating that I have been an obstruction to reductions in the price of gas? Besides, Mr. Falkner must know that the chairman of a committee is not the committee itself, though he may have what Mr. Falkner deems an 'all dominant mind.' In my individual case, I may say I had almost as little influence in forming the many gas committees over whom I have had the honour and pleasure to preside, as in forming the committee of the Gas Consumers' Association. For I believe that, until the last nomination of the gas committee, I never recommended a single member but one, and that was Mr. Alderman Simpson, my successor as its chairman, and from whose ability, zeal, and general qualifications—aided as, in the improved constitution of the present committee, I am confident he will be—I anticipate a continuance of that great prosperity which has hitherto been an exemplary distinction of the Manchester Gas-Works. Announcing that I shall leave further correspondence on these matters to those who are now the proper parties to attend to them,—I remain, your obedient servant,

"J. SHUTTLEWORTH.

"*Wilton Polygon, Nov.* 24, 1859."

"*To the Editor of the Examiner and Times.*

"Sir,—With your permission, and according to promise, I will proceed to review Mr. Shuttleworth's letter of the 24th instant. The charge I made in my previous letter was, that the gas-works of Manchester were disgracefully mismanaged, and I founded this charge on a comparison of the position of those works in 1847 and 1858. I furnished you the following particulars, extracted from Mr. Shuttleworth's address to the council on the 25th of September, 1847, and from the corporation accounts of 1858:—

	1847.	1858.
Capital	£250,000	£500,000
Gas produced	340,000,000 feet.	690,000,000 feet.
Rental	£80,000	£141,000
Meters	10,000	28,000
Tenants	9,500	27,000
Mains	109 miles	250 miles.
Profits	£37,100	£29,013

"The result is that with an increased rental of £60,000, there is a decreased profit of £8000.

"Mr. Shuttleworth's reply is tantamount to this. The Manchester Gas-Works 'are exceptional in their character;' they are carried on with 'borrowed capital;' they have debts laid upon them by the corporation, and in consequence they are not to be compared with any other establishment that is 'founded and trades on real capital.'

"Had I contrasted the Manchester works with Liverpool or Birmingham, or with any other establishment, this defence would have held good; but I compared the Manchester Gas-Works of 1847 with the same works in 1858. The same mode of balancing is adopted, and the profits are authenticated by the same chairman.

"It is not my intention to follow Mr. Shuttleworth's line of argument, but to confine myself to my own. He makes no objection to the figures I quote. It is true 'that he writes at home, where he has not the exact figures and accounts to refer to;' but I am aware that on the day he wrote his letter he visited the gas-works, where the books are kept, and if my figures were unfairly stated, he was in a condition to have challenged them. He, however, ridicules the use of the word 'capital' as applied to the first item. In contrasting the two periods, I was careful to copy the precise titles given by Mr. Shuttleworth in his speech of the 25th of September, 1847, to each account, and in the precise order in which he records them—1st, capital; 2nd, gas produced; 3rd, rental; 4th, meters; 5th, tenants; 6th, mains; 7th, profits; and therein his words are, 'The capital, in round numbers, is £250,000.' Now, he remarks, '*In point of fact, there is no capital.*' Let it be so; what I desire to establish is, that since 1847 there has been an outlay on the works of £250,000, and for what purpose?

"From the manner in which Mr. Shuttleworth introduces the Market Street improvement debt, it is of importance that the public should understand that in the year 1843 this was transferred to the gas-works; consequently, it equally affects the balances of 1847 and 1858, and can in no way account for the existing deficiency. This debt, one of the evils which the council has inflicted on the gas-works, amounts to nothing more than the application of the profits of the gas to an *old* improvement in place of a *new one*.

"'Increased borrowing,' extravagant outlay, and injudicious arrangements with the manager, can alone account for the fact that, with £250,000 outlay in 1847, the profits were £37,000, while, with £500,000 outlay in 1858, the profits are only £29,000, and yet the present gas-works are 'exemplarily distinguished for their great prosperity.' It is unnecessary to defend them. He is proud of his connexion with them. Lay aside the corporation accounts

which he has signed, and balanced anew 'in the way he has explained,' adding interest to profit, then things will look much more pleasant. How unbecoming in any one to censure him! Such is the reply.

"Let us glance, however, at this 'increased borrowing.'

In 1845	the debt was		£67,000, profit, £35,000
„ 1851	„	„	97,600
„ 1852	„	„	118,750
„ 1853	„	„	123,000
„ 1854	„	„	133,450
„ 1855	„	„	195,925
„ 1856	„	„	217,675
„ 1857	„	„	222,775
„ 1858	„	„	294,053
„ 1859	„	„	308,570, profit, £29,013.

"Where is this borrowing to stop? and for what objects are these funds spent? Is it to supply us with more gas? In 1847 the chairman had the control of these works, and he then stated in his speech they were capable of producing 18 *millions per week*. Our consumption even now, in 1859, has not yet reached 13 millions. What then has caused this imperious demand for an expenditure of another £250,000? For my own part, I can only come to one conclusion, in which, I think, the public will coincide—that, notwithstanding Mr. Shuttleworth's able letter, the gas-works of this city have been grossly mismanaged.

"Mr. Shuttleworth reminds me he has ever manifested a desire to oppose the appropriation of the gas profits to the 'two sucking children.' So I observe in his speeches, but I also note his persistent opposition to the reduction in the price of gas. A reduction in price would have at once accomplished the desired object, with this advantage, that the operation would have been more direct, and would have immediately benefited the consumer; but this he would not entertain. Even the late reduction from 5s. to 4s. 6d., this moderate reduction met with his decided negative, and was at last carried against his efforts—a symptom that his influence was waning.

"Such words as 'ignorant,' 'unscrupulous,' 'wanting in candour,' 'in truth,' 'in honesty,' &c., are not arguments, but vulgarities, and can have no weight with the public. They have long been used by this gentleman in the corporation, and I cannot expect to escape from my share of abuse; but I can state that of which he appears to be ignorant, that with a little more gentlemanly language and deportment he might still have retained his seat in the city council.

"Mr. Shuttleworth has, however, left us a legacy by 'recommending us his successor.' This will be of no advantage to him, and it will certainly entail on us an extra supervision. We would have preferred new blood when the system is to be so thoroughly altered. We would rather not have the works in the hands of any friend of Mr. Shuttleworth. However, if Mr. Alderman Simpson pursues a course in accordance with the interests of the gas consumers he will have their support. The 'borrowing account' must be closed; the debt and interest reduced; the price of gas lowered to 3s. 9d.; and, instead of laying mains eight miles to Cheadle to secure customers there, let him supply the thousands who know nothing of the advantages of gaslight, and who are placed closely around our own gas-works. By these means, and by avoiding the errors of the past, Mr. Alderman Simpson will gain our steady support; but should he, on the contrary, revert to the old ways, he must vacate his post of honour like his predecessor.

"This question for the future is left in the hands of those who 'are now the proper parties in the corporation.' But, depend upon it, the whole credit of the defence of the Manchester Gas-Works will redound to the late chairman, as it is not likely that others will undertake such an ungracious task.

"I thank you for the space you have allotted to this question, and your insertion of the above will oblige,—Yours most respectfully,

"ROBERT FALKNER,
"Chairman Gas Consumers' Association.

"*Stevenson Square, Nov.* 30, 1859."

ON SOUNDS EMITTED BY THE COMBUSTION OF GAS.

By M. BARENTIN.

(From *Poggendorf's Annalen*, Nov. 5, 1859.)

When combustible gas escapes through an aperture, the velocity of the escape is modified by applying a light to it. This velocity is still further diminished by enclosing the flame in a tube in such a manner as to produce a sound. The writer has made various experiments on this subject, varying the conditions of the apparatus; and he has obtained results which it might be interesting to particularize.

When common gas issues out through a glass tube, the velocity, which was 1 before it was lighted, became afterwards 0·74, and 0·70 when made to give out a sound in the tube. When a metallic tube was used, the velocity under similar conditions varied from 1 to 0·56. When the tube was arranged like an argand burner, furnished with sixteen holes, the velocity varied from 1 to 0·67.

In order to produce sound from the flame, the author used glass tubes with contracted mouths. After some time the extremity of the tube became reddened, the form of the mouth was altered, and it became difficult to compare the results. By adopting suitable precautions, M. Barentin obtained, as an average result, a velocity of 1 for gas flowing under ordinary conditions, 0·76 when burning freely, and 0·71 when burning in a tube so as to produce a sound.

It is well known that the quality of the sound depends on the size of the tubes in which the flame is produced. The velocity of the escape also varies with the acuteness of the sound. Measuring the velocity for the tones ut, mi, sol, the author obtained 1, 0·94, 0·88. Other similar experiments have induced him to lay down as a general rule, that the velocity of the escape diminishes in proportion to the increased acuteness of the sound.

These experiments, although few and incomplete, nevertheless indicate a remarkable connexion between the velocity of the gas in the tube which serves for its escape, and the constitution of the jet which passes into the surrounding medium. This velocity depends on the temperature of the jet, on the heating of the tube's mouth, on the vibrations produced by the creation of sounds, &c.; whilst recent experiments have placed beyond doubt the intermittent character of the flame when sound is produced. The results obtained by M. Barentin evidently agree very well with this peculiarity of sonorous flames; and it is thought, moreover, that the quantity of gas which escapes would be less in proportion to the acuteness of the sound, or, more properly, to the rapidity of the intermissions.

THE LIME LIGHT COMPANY.—A company has been formed for the purpose of working two patents which have been taken out for a light that it is stated will combine steadiness, purity, economy, and simplicity, as well as the capability of being managed with ordinary attention. The light is obtained by projecting a jet of oxygen and hydrogen or carburetted hydrogen upon a surface of lime, and so regulating the supply and protecting the lime from crumbling away as to ensure with continuancy the maximum brilliancy of the light. A single jet is found to vary in power in a higher ratio than that of the quantity of gas consumed, and in one of medium size the power is stated to be equivalent to eighty fish-tail burners, each consuming five cubic feet of ordinary gas per hour. The intensity of the light, unassisted by a reflector, is forty times greater than the present argand oil lamps, used for coast lights. Professor Faraday stated in his lecture last Christmas that the present Trinity House lamp, assisted by a parabolic reflector, transmitted light twenty-five miles, and that the oxy-hydrogen lime light under similar conditions was perceptible at ninety-five miles' distance. The light is applicable to coast lights, steamers, sailing-ships, railways, churches, factories, thoroughfares, &c., the application to street lighting being reserved for future consideration by the company. From its portability it is considered to be adapted for military purposes, both in the field and in the attack and defence of positions. The cost is considered more economical than any other light. No doubts are entertained by the projectors of the undertaking paying, and it is stated that the Trinity House alone pay the sum of £353,000 per annum for lights on the coast. The light has been exhibited at most of the principal buildings in the metropolis, and in the centre transept of the Crystal Palace, and the immense power of illumination possessed by it was satisfactorily shown in the clear rays of light which illuminated the transept from end to end. A large company having been invited to witness this exhibition, the inaugural dinner of the company, assembled, after the experiment at the Crystal Palace, to do honour to the occasion. In the course of the evening, Sir Charles Bright expressed his opinion that the scheme would prove successful. He looked upon the undertaking as a national one, and thought that it would be found much more practical than the electric light.

Price Current.

CASTINGS, PER TON.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	3 17 6	2 15 0	3 5 0	3 5 0	3 10 0
1¼ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 „ „	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 „ „	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards „	5 15 0	4 15 0	5 0 0	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
„ 2nd „ cold „	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅜ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4½
„ „ „ 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
„ with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Plain Sockets [Nipples	1 3	0 9	0 8	0 6	0 5	0 4
	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	—

COALS, PER TON.

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 3d.	Boghead, at Leith	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	6 6	Kirkness, best	23 0
Pelaw	6 9	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 0	„ 2nd „	12 6
Pelton	7 9	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16 0	„ „ Leith	27 6
		Arniston	22 0
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	15 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s. 0d.	
Cliff's Fire-bricks, at Wortley	per 1000	57 6	
Ingham's Fire-bricks, at Wortley	„	55 0	
Fire-clay Retorts	per foot run,	5s. 6d. to	7 0
Tough Cake Copper	per ton £102	0s.	
English Pig Lead	„	21 5	
Welch Bar Iron, in London	„	6 15 0	
Foreign Spelter	per ton	£21	7 6
English Block Tin	„	132	0 0
Banca	„	136	0 0
Tarred Rope Yarn	per cwt.	26s. 0d.	

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham & Rochester	7s. 3d.	Boulogne and Calais	£8 0 0
Cork	9 6	Barcelona	23 0 0
Dover	8 0	Bordeaux	14 0 0
Dublin	10 0	Cadiz	19 0 0
Exeter Quay	9 0	Copenhagen	—
Folkestone	8 0	Dieppe	10 0 0
London (Pool)	7 4½	Genoa	22 10 0
Lowestoft & Yarmouth	5 0	Hamburg	9 7 6
Lynn	—	Havre	10 5 0
Portsmouth	8 6	Leghorn	22 0 0
Plymouth	9 0	Lisbon	18 0 0
Ramsgate	8 0	Rotterdam	7 17 6
Whitstable	—	Stettin	—
Weymouth	—	Trieste & Venice	£23 to 27 0 0

THE STANDARD CUBIC FOOT

FOR THE VERIFICATION OF

GAS-METERS

ACCORDING TO

LORD REDESDALE'S ACT,

CONSTRUCTED BY

E. W. LADD & CO.,

Was placed in the Office of Her Majesty's EXCHEQUER on the 14th ult., and its accuracy confirmed by

The ASTRONOMER ROYAL, and Professor MILLER, of Cambridge.

E. W. LADD and CO. are now prepared to supply Copies of the above Standard of guaranteed accuracy, and beg to suggest that the interval before the Act comes into operation being limited to Six Months, it will be necessary to give early orders to ensure promptness in their fulfilment.

E. W. LADD & CO.,

BULLION WEIGHT AND BALANCE MANUFACTURERS

TO THE BANK OF ENGLAND,

AND

GAUGING INSTRUMENT MAKERS

TO THE BOARD OF INLAND REVENUE,

1, OLD JEWRY, LONDON.

ESSON'S PATENT

COMPENSATING GAS-METER

Is guaranteed correct within the meaning of the "Sale of Gas Act." Manufactured only by WILLIAM COWAN, Buccleuch Street Works, EDINBURGH; and St. Mary's Gate, MANCHESTER.—Established 1827.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD, LONDON.

N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

Now ready, price 6s., roan tuck, neat,

THE Engineer's, Architect's, and CONTRACTOR'S POCKET-BOOK (WEALE'S) for the year 1860. This valuable work has this year been considerably improved, and partly remodelled. New features have been introduced, calculated to extend its sphere of usefulness to several branches of the Profession not hitherto addressed, such as Gas Engineers, &c. Other improvements are in contemplation for future years' issues.

London: LOCKWOOD and Co., STATIONERS' HALL COURT, E.C.

AMMONIACAL LIQUOR.

THE Directors of the British Gaslight COMPANY (LIMITED) are willing to receive Proposals for One, Two, or Three Years, as may be agreed upon, for the whole of the AMMONIACAL LIQUOR (about 100,000 gallons per annum) produced at their Norwich Stations.

Tenders to be sent to the Company's Offices, 11, George Yard, LOMBARD STREET, E.C.

FREDERIC L. LINGING, Secretary.

WANTED, at a small Gas-Work in the Country, a steady respectable Man, who is able to do the Gas-fitting and lighting the Public Lamps.

Applications, stating age, references to character, and wages expected, to be addressed X. Y. Z., care of the PUBLISHER of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND CONTRACTORS.

WANTED employment with the above,—has been similarly engaged in an office for the last five years. Accustomed to keep Books, prepare Accounts, and collect Gas Rentals, &c. Aged 28. References to former employers.

Address to W. R., 6, Great Winchester Street, CITY, E C

ROBERT MACLAREN and CO., EGLINTON FOUNDRY, GLASGOW, Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,
&c. &c.

LONDON OFFICES:
76, KING WILLIAM STREET, CITY.

A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs. CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

TO GAS & WATER COMPANIES, ENGINEERS AND FITTERS.

GARSIDE'S Registered Tube-Vice holds all sizes of Wrought-Iron and Brass Tubes with the greatest firmness and least possible pressure; consequently it is not so liable to split or damage the Tubes as the ordinary Vice, and considerably facilitates the Workman, who may do almost double the quantity of work. Also,

GARSIDE'S IMPROVED MAIN-DRILLING CLIPS, for Drilling Holes for Service-Pipes. With this instrument the perforation of Pipes for the attachment of smaller Tubes can be effected with great ease and precision. Likewise,

HEAP'S REGISTERED GAS TONGS, most highly approved of as vastly superior to those in present use. Stocks, Taps, and Dies, together with all tools connected with Gas Engineering.

For Drawings, Testimonials, and prices, apply to the Maker, S. GARSIDE, Stamford St., ASHTON-UNDER-LYNE.

CLEGG ON COAL GAS.

Just Published, price £1. 11s. 6d., the Third Edition, greatly enlarged, with numerous additional Illustrations, of

A PRACTICAL TREATISE on the MANUFACTURE and DISTRIBUTION of COAL GAS, its Introduction and Progressive Improvement. By SAMUEL CLEGG, Jun., M. Inst. C. E.

London: JOHN WEALE, HIGH HOLBORN.

GEORGE ANDERSON, Gas and CONSULTING ENGINEER,
104, LEADENHALL STREET, LONDON (E.C.).

DIRECT-ACTING GAS-EXHAUSTERS,
supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,
one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,
designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

LESMAHAGO GAS COAL.

JAMES FERGUSON and CO., Lessees of the Auchinheath and Craignethan Gas Coalfields (the most extensive and valuable in the parish of Lesmahago), respectfully intimate to the Managers of Gas-Works and Consumers of Gas Coal, that they are prepared to ship the best quality of the above well-known COALS at Glasgow or Leith; and also to deliver them at the railway stations upon, or connected with, the Caledonian Railway, to any extent which may be required.

Price, free on board, or delivered at the railway stations, may be learned by addressing James Ferguson and Co., Gas-Coal Works, Lesmahago.

Shipping Agent for Glasgow:
MR. ALEXANDER STRATTON,
159, WEST GEORGE STREET.

METROPOLITAN BOARD OF WORKS.

MAIN DRAINAGE OF METROPOLIS.
SOUTHERN OUTFALL TUNNEL SEWER.

TO Builders and Contractors ex- perienced in Tunnel Works. The Metropolitan Board of Works hereby give notice, that they will MEET in the Council Chamber, Guildhall, in the City of London, on FRIDAY, the 6th day of January, 1860, at TWELVE o'clock at Noon precisely, and will then be prepared to open TENDERS by parties who may be willing to CONTRACT for the CONSTRUCTION of a MAIN BRICK SEWER, 7 miles 2240 feet in length, or thereabouts (5000 feet of this length being in tunnel), and for the execution of other works in connexion therewith; such Sewer to extend from a point in Erith Marshes, opposite Dagenham Breach, in the county of Kent, to Woolwich, and through and under Woolwich to Norman's Road, otherwise North Pole Lane, Greenwich, in the same county.

Parties desirous of submitting Tenders may, upon payment of £3, obtain Plans, Sections, Specification, Form of Tender, and other particulars, on application to J. W. BAZALGETTE, Engineer of the Board, at the Office of the Board, between the hours of Nine a.m. and Four p.m.

Tenders, addressed to the Metropolitan Board of Works, must be delivered at the Office of the Board, No 1, Greek Street, SOHO, before Four o'clock p.m., on Thursday, the 5th day of January, 1860, and no Tender will be received after that hour.

The Board do not bind themselves to accept the lowest or any Tender, and the party whose Tender shall be accepted will be required to provide two approved sureties for the due performance of the works.

E. H. WOOLRYCH, Clerk of the Board.

No. 1, Greek Street, Soho, Nov. 17, 1859.

FOR SALE, a Small Direct-Action STEAM-ENGINE, in good condition, 6-inch Cylinder, 12-inch stroke.

For particulars apply to the MANAGER, Worcester Gas-Works.

WM. RICHARDSON and CO., SPRING GARDEN IRON-WORKS,
DUDLEY, near BIRMINGHAM,
Manufacturers of Gas Apparatus in all its branches. A large assortment of New and Second-hand Gas Apparatus constantly for Sale.
Gas Apparatus Enlarged and Exchanged.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,
GLOBE PATENT TUBE WORKS,
WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

FIRE BRICKS.

THE MACHEN COLLIERY COMPANY, NEWPORT (MON.).

Shippers of Fire-Goods of First-class quality manufactured from a remarkably pure seam of Fire-Clay.

Railway Communication by Broad or Narrow Gauge with all parts of the Kingdom, and by Seaboard, Coastwise, and Foreign.

CAUTION.
TO GAS-METER MANUFACTURERS AND OTHERS.

THE Undersigned hereby caution Meter Manufacturers and others against infringing the exclusive right of the Undersigned to the use of the Screw Adjustment for regulating the Height of the Overflow-Pipes in Wet Gas-Meters, as described in the Specification of the Letters Patent granted to Crosley and Goldsmith on the 19th of April, 1856; as well as against infringing any other portions of that or any other Patent of the said William Crosley; and

NOTICE is further given, that all Infringers of the said Inventions, or any portions of them, will be proceeded against. CROSLEY & CO.,
103, SOUTHWARK BRIDGE ROAD,
LONDON, Aug. 29, 1859.

WALTER MABON, Engineer, ARDWICK IRON WORKS, FAIRFIELD STREET
MANCHESTER,
Manufacturer of
IRON TANKS for Gasholders, Railway Stations, &c.
GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.
GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.
WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.
IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.
PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

FIRE-CLAY RETORTS.

JOHN SWARBRICK,

MANUFACTURER OF PATENT COMPOSITION CLAY RETORTS,

FIRE BRICKS OF EVERY DESCRIPTION, SHAPE, AND SIZE, &c. &c.

HIGHER EANAM, BLACKBURN, LANCASHIRE.

These RETORTS are generally used in the Gas-works of Preston, Accrington, Bury, Heywood, Middleton, Rochdale, Ratcliffe; the Mills of Messrs. Horrocks, Miller, and Co., Preston, &c. &c., and are unequalled in having afforded general satisfaction to those who have given these Retorts a trial.

To meet the increasing demand, the Works at Little Harwood have been greatly enlarged; and Gas Engineers who may favour with an Order may rely with confidence on their being promptly supplied with an article not to be surpassed in finish or durability.

PRICES MODERATE.

LIVESEY FIRE-CLAY WORKS,

NEAR BLACKBURN, LANCASHIRE.

ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

KINSON FIRE BRICKS are indestructible by heat, and are warranted to last twice as long as Stourbridge, Newcastle, or Welsh bricks. 80s. per 1000 at Nine Elms Station.
WORKS: POOLE, DORSET.

WILLIAM RYDER, General MINERAL AND METAL AGENT AND MERCHANT, 4, DEAN STREET, NEWCASTLE-ON-TYNE,
is prepared to supply Gas and Water Companies with Apparatus and Appliances of every description, including Cast and Wrought Iron Goods, Coals, Fire-Bricks, Retorts, &c. &c.
Any communications addressed to him as above shall have prompt attention.

J. CLIFF'S Fire Bricks, Clay RETORTS, &c.

Orders for London and South of England to be addressed to Mr. NEWTON, Agent for the District, 16, Castle Terrace, New Hampstead Road, KENTISH TOWN, N.W.
N.B.—A few Retorts of each size, and a large stock of Bricks and Lumps, always on hand at the above Wharf.

THOMAS PHILLIPS, 55, SKINNER STREET, SNOW HILL, Patentee and Manufacturer of all kinds of Cooking Apparatus, Baths, Conservatory Boilers, &c., for Gas. Gas Stoves from 16s.; Cooking Apparatus from £1. Every article warranted.
N.B.—Public and Private Establishments fitted by Gas or Hot Water.

TO GAS COMPANIES.
BENJAMIN KITT, GAS AND CONSULTING ENGINEER, UPPER BRISTOL ROAD, BATH.
Gas-Works taken on Lease, Gas-Works Erected, Plans and Specifications given for any Apparatus connected with Gas Making and Gas Distributing on the most modern improved scale.

WILLIAM PARKINSON AND CO.,

(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.,

PATENTEES AND MANUFACTURERS OF

GAS-METERS, GOVERNORS, AND OTHER APPARATUS;

ALSO,

METERS FOR MEASURING WATER, &c., &c.

IMPROVED LOW-SPOUTED GAS-METERS,

Which completely meet the requirements of Lord Redesdale's Sale of Gas Act, and are as simple in their construction, satisfactory in working, and as low in price as the well-known Meters which have been made by W. P. and Co., and their predecessor, Mr. Samuel Crosley, during the last forty years, and of which there are about 300,000 now in use.

STATION-METERS AND GOVERNORS

Of all Sizes, of the best Construction, Materials, and Workmanship, supplied on the shortest notice.

There are about 300 Station-Meters at work of their manufacture, of sizes varying from 750 to 60,000 cubic feet per hour, of which the following are some of the principal ones, recently supplied by them to London Gas Companies, viz. :—

2	for 60,000	cubic feet per hour	each to the	Chartered Gaslight and Coke Company, Westminster;
1	„ 40,000	„	„	Chartered Gaslight and Coke Company, Brick Lane;
2	„ 60,000	„	„	London Gaslight Company, Vauxhall;
1	„ 60,000	„	„	Commercial Gas Company, Stepney;
1	„ 40,000	„	„	Equitable Gas Company, Pimlico;
1	„ 40,000	„	„	Phœnix Gaslight Company, Greenwich,

&c. &c. &c.

And they have also supplied large Station-Meters to the Gas Companies at Birmingham, Nottingham, Sheffield, Southampton, Leeds, Newport, Glasgow, Manchester, Dublin, Cork, and all the principal towns in the United Kingdom, as well as many on the Continent, &c., &c.

Their Station Gas-Governors have been adopted by most of the above-named Companies, and have given universal satisfaction.

PRESSURE REGISTERS, EXPERIMENTAL METERS, PHOTOMETERS,

Minute Clocks, Consumers' Gas-Governors, Pressure-Gauges,

STANDARD EXPERIMENTAL GASHOLDERS FOR PROVING METERS, &c.

GEORGE LOWE'S PATENT NAPHTHA BOXES AND MOTIVE-POWER METERS,

WITH MACHINERY FOR WEIGHTS TO ASSIST THE SUPPLY OF GAS WHERE THE PRESSURE IS LOW.

SPECIFIC GRAVITY APPARATUS, RAIN GAUGES, &c.

BOULTON'S PATENT

DRY GAS-METERS,

Of which upwards of 24,000 are at present in use, having gained for themselves an unparalleled patronage from all the principal Gas Companies and Consumers, on account of their unerring registration and the superior workmanship and materials used in their construction, enables the Patentee to sell them now at competitive prices with those of other makers.

Every description of Improved Wet or Patent Dry Meters and Gas Apparatus manufactured by

JOSEPH BOULTON,
28, BAGNIGGE WELLS ROAD, CLERKENWELL.

THE UNIVERSAL

GAS-BURNERS REGULATOR,

(GEYELIN'S PATENT,)

The only one in the world by which the flame from Argand, Fish-tail, and all other Burners remain invariable under all variations of pressure, and the cost of each light is less than one farthing per hour.

Can be fixed horizontal, close to, or distant from, the Burner; is ornamental, simple in construction, consisting of a double chamber, the inner perforated, covered with a diaphragm giving action to a spherical valve.

PRICE 3s. EACH.

Can at all times be seen tested at the Manufacturer's,

JOSEPH BOULTON,
28, BAGNIGGE WELLS ROAD.

CHARLES BOTTEN and SON,
ENGINEERS & METER-MAKERS,
CRAWFORD PASSAGE, RAY STREET,
CLERKENWELL, LONDON (E. C.).

Manufacturers of Station and Patent Protector Consumers' Meters, Patent Slide-Valves, Gas-Fittings, Pipes, &c.
Also, High-pressure Cocks, Hydrants, Closets, and all Water-Fittings.

WEST and GREGSON, Gas-Meter
MANUFACTURERS, &c.
UNION STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.
W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

EIGHTON MOOR GAS COALS.—Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

WROUGHT-IRON Guides for Gas-HOLDERS, when Trussed upon scientific principles, are more capable of resisting strains, in every direction, than Cast Columns of any form can be; and weigh only one-fifth as much as the latter. Designs and Working Drawings for Guides and Ties can be obtained of the Inventor, CHARLES DIXON, C.E., Chichester, SUSSEX.

ALFRED PENNY, Engineer,
WENLOCK IRON WORKS,
WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY begs to inform Gas and Water Companies that he undertakes the erection of new, or the alteration of existing, works; and that he may be consulted generally on all matters connected with gas and water supply. He is also prepared to supply best Cold-blast Retorts, Socket-Pipes, and Connections, Iron Borings, &c. &c., and all the necessary Castings used in Gas and Water-Works.
*** Country orders executed with care and despatch.

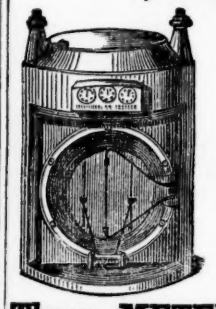
JOHN ROGERSON and CO.,
NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.
LONDON HOUSE:
12, ROYAL EXCHANGE BUILDINGS.

JAMES MEACOCK,

PATENT DRY AND WET GAS-METER MANUFACTURER,

7, SNOW HILL, AND 16, WEST STREET, LONDON.



ESTABLISHED 1836.

JAMES MEACOCK begs to thank Gas Companies and the Trade generally for the very liberal support awarded him in his Patent Dry Gas-Meter; his Improvement in connecting the Diaphragm between Metal Rings, cemented and screwed to the Tin Frames, being pronounced by Gas Engineers to be the most perfect improvement to the Dry Meter since its introduction.

J. M. invites attention to his Improvements in **EXPERIMENTAL WET GAS-METERS**, by which he renders impossible any Leakage from the Stuffing-Box.

These METERS are GUARANTEED to meet all the REQUIREMENTS of the SALE OF GAS ACT.

GOVERNORS, STATION-METERS. PHOTOMETERS,
EXPERIMENTAL TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,
AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

ALEXANDER WRIGHT,

GAS ENGINEER, MANUFACTURER OF GAS-METERS, GOVERNORS, AND EVERY DESCRIPTION OF GAS APPARATUS,
55, MILLBANK STREET, WESTMINSTER.

CONSUMERS' METERS at the List Price, with a Liberal Discount to Wholesale Purchasers.
THOMPSON'S BROMINE TEST, £1. 1s.—BROMINE, 3s. per Ounce.
BISULPHURET OF CARBON TEST, £2. 2s.
APPARATUS FOR DETERMINING THE HEATING POWER OF SAMPLES OF COAL AND OTHER DESCRIPTIONS OF FUEL, £5. 5s.,
INVENTED BY LEWIS THOMPSON, Esq., M.R.C.S.
REGISTERING PRESSURE GAUGE, Net Price, £8. Glass Shade, 10s. extra.
STATION METERS, PRESSURE GAUGES, PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, &C.

LORD REDESDALE'S "SALE OF GAS BILL" having received the sanction of the Legislature, Gas Companies and Consumers are respectfully informed that **ALL** Meters made at this Establishment are constructed most carefully to meet the requirements of this Act.

WRIGHT'S COMPENSATING METER possesses peculiar claims on the attention of those who desire to obtain a most simple and thoroughly efficient instrument at a moderate price.

CANNEL and COAL of the best de-scriptions for making GAS and COKE.
(As per Analyses.)
GAS CANNEL, 17s., 15s. 6d., and 14s. per ton.
GAS COAL, 11s. 6d., 9s. 6d., and 8s. 6d. per ton.
STEAM COAL, 10s., 9s. 6d., and 9s. per ton.
All free on board Vessels in Liverpool.
Handpicked Cannel and Coal about 10 per cent. additional. Concession in prices made for large quantities.
GAS APPARATUS of all descriptions, and on the most approved principles; also Purifying and other materials supplied.
ANALYSES, PLANS, and ESTIMATES, and other information required, and the highest references furnished on application.
CONTRACTS for Materials and Works entered into.
No charge made for Superintending Shipments, Preparing Bills of Lading, or passing Entries.

EMANUEL TURNER and CO.,
EXPORT OFFICES:
34, CASTLE STREET, LIVERPOOL.

NO CHIMNEY WANTED FOR
RICKETS'S PATENT CALORIFERE
GAS STOVES,
IN CHURCHES, HALLS, OR SHOPS;
And for Conservatories, or any close apartment, a pipe can be attached to convey away the burnt air.

RICKETS'S CHEAP GAS STOVE,
Price £1. 15s.,
Made of sheet-iron, suitable for heating small Counting-houses, Bed-rooms, Cellars, &c. &c.

MANUFACTORY,
AGAR STREET, STRAND, LONDON.
Liberal Discount to Gas Companies, Builders, and the Trade.

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF,

WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. B. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.

PADDON and FORD respectfully invite the attention of Gas Companies and Managers to their PATENT STREET LAMP REGULATOR, which ensures any required consumption.

By its use a great saving is effected, and the item of "Unaccounted-for Gas" considerably decreased.

PADDON and FORD, Patent
GAS-METER AND APPARATUS WORKS,
GRAY'S-INN-ROAD, LONDON,

Manufacturers of WET and DRY GAS METERS, STATION METERS, GOVERNORS, EXPERIMENTAL APPARATUS, LANTERNS, &c. &c.

Contractors for the erection or alteration of Gas-Works; and every description of Apparatus required in Gas-Works supplied.

GEORGE CUTLER, Gasholder
MAKER,

No. 8, WENLOCK-ROAD, CITY-ROAD, LONDON.

Contracts for Tanks, Gasholders, Roofs, Purifiers, and all descriptions of Gas Apparatus executed on the most reasonable terms. Improved Slide Valves, Steam, and Range Boilers, and Smiths' Work, of the best materials and workmanship.

WILLIAM CLIBRAN'S Patent
MERCURIAL GAS-GOVERNOR FOR STREET LAMPS.

W. C. begs respectfully to call the attention of Gas Companies to his PATENT GAS-GOVERNOR for STREET LAMPS, upwards of 3000 of which are now in use on Public Lamps. By their use any given quantity of Gas per hour may be consumed with the tap full open whatever the increase of pressure may be, thus preventing a great waste of Gas in many of the Lamps, and securing to the public an uniform light. Prices, 3s. 4d., 3s. 6d., and 3s. 8d. each.

Governors kept in stock from three-eighths of an inch to four inches bore.

Samples and Testimonials forwarded on application to WILLIAM CLIBRAN, 43, Todd Street, MANCHESTER

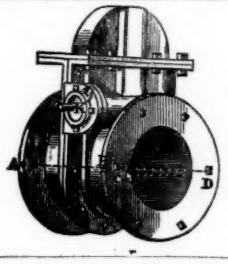
BENJAMIN GIBBONS, Jun.,
DEEPDALE FIRE-CLAY & BRICK WORKS,
Near DUDLEY,

Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,
TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

References given, if required.



BRYAN DONKIN & CO.
keep always on stock their
IMPROVED GAS VALVES
from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,
ENGINEERS,
NEAR GRANGE ROAD, BERMONDSEY.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

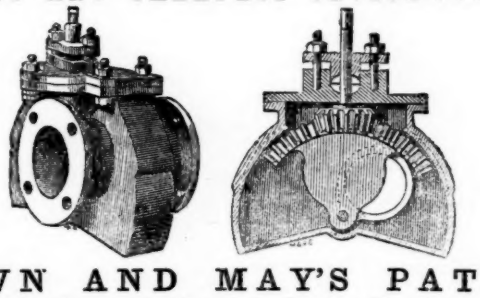
Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, MR. E. M. PERKINS, 78, Lombard Street.

HARRIS and PEARSON
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.
MANUFACTURERS OF
FIRE BRICKS GAS RETORTS &C.
AMBLECOTE FIRE CLAY AND BRICK WORKS,
STOURBRIDGE.
Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.

BEST AND CHEAPEST SLUICE-COCK.



BROWN AND MAY'S PATENT.

Above 3-inch diameter, price 10s. per inch. Brass face, 6d. per inch extra.

Can be taken to pieces without being removed from the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C., Where a Sample may be seen.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

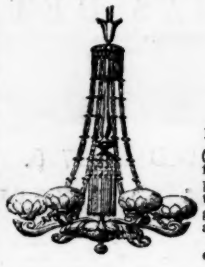
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

London Agents: CHADWICK and AKEROYD, Willington Stone Wharf, Regent's Park Basin.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20, WHARF ROAD,
CITY ROAD, LONDON,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.
N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.
CHARLES HORSLEY, Agent.
C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.



F. & C. OSLER,
45, OXFORD STREET, LONDON;
Manufactory—Broad Street, Birmingham—Established 1807,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.
ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.
THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

SALE OF GAS ACT.

MESSRS. CROLL, RAIT, AND CO.,

Manufacturers of Croll's Patent Improved

DRY GAS-METER,

being informed that several Gas Companies are under the impression that Dry Meters will not be allowed by the above Act, beg to say that such is not the case, inasmuch as the Act embraces "every kind of machine used for measuring gas," and provides for the testing of the same, in its 13th clause.

Speaking for themselves, and of the Meters manufactured by them, C., R., and Co. have the gratification of knowing that not one single Meter out of the large number they have sold, will, when tested by an Inspector, be rejected; and, consequently, that neither Gas Companies nor Consumers who have these Meters in use will be put to one farthing expense for alterations.

C., R., and Co. always adopted the unit of measure provided for by the 2nd clause of the Act, and have never allowed themselves a greater latitude than 1 per cent. either fast or slow, and they intend to adhere to these limits, notwithstanding that the Act allows 2 per cent. fast and 3 per cent. slow.

C., R., and Co.'s Meters register most correctly all the gas passed through them, whether it be the smallest quantity or the full complement for which the Meters are made; and *they are prepared to give written guarantees to Purchasers that the Meters shall, when tested by an Inspector on his appointment under the Act, be approved of by him as correct. In the event of such not being the case, the Purchaser to be entitled to return the Meters to C., R., and Co., and claim from them their cost, together with any expenses incurred by their rejection.*

Further, C., R., and Co. undertake, during a period of five years from the date of purchase, to put into good order, free of charge to the Purchaser, any Meters of their manufacture which may become defective.

CROLL, RAIT, AND CO.,
DRY GAS-METER MANUFACTURERS,
CANAL BRIDGE, KINGSLAND ROAD, N.E.,
are prepared to supply
STANDARD CUBIC FOOT MEASURES,
of the Capacity required by the 2nd Clause of the Act,
as well as Gasholders correctly graduated thereby.
STATION-METERS, GOVERNORS, PRESSURE-REGISTERS, AND OTHER GAS APPARATUS SUPPLIED.
Particulars given upon application.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,
invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.
MANUFACTURERS OF
GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;
DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;
IMPROVED FULL-WAY CARTER'S VALVES (much approved of);
GAS-STOVES, and every article connected with Gas Apparatus.
CAST & WROUGHT-IRON PIPE, BLACK & GALVANIZED. COPPER. TIN, BRASS, & COMPOSITION TUBING.
D. HULETT'S IMPROVED SERVICE CLEANSER
for clearing out Mains, Services, and Interior Fittings—60s. net.
Boyle's Patent Silvered Glass Combination Reflectors and Outside Lanterns.
Sole Manufacturers of Church and Mann's Photometer.
Large Pattern Books, with every description of Gas-Fittings, Chandeliers, &c., with complete Book of Prices, 12s.

London: Printed by WILLIAM BOUGHTON KING (at the office of Joseph Clayton, 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, December 6, 1859.